Mathematisches
Forschungsinstitut
Oberwolfach

Mitglied der Leibniz Gemeinschaft

Jahresbericht 2016
Annual Report

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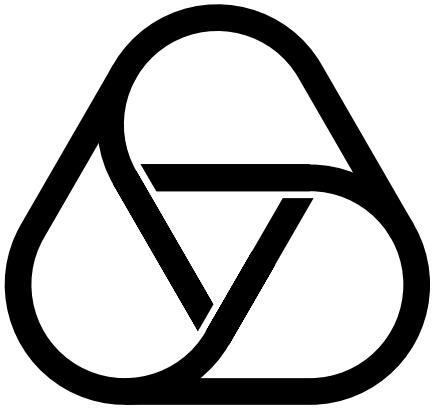

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Mathematisches Forschungsinstitut Oberwolfach

Direktor
Gerhard Huisken

Gesellschafter
Gesellschaft für Mathematische Forschung e.V.

Adresse
Mathematisches Forschungsinstitut Oberwolfach gGmbH
Schwarzwaldstr. 9-11
77709 Oberwolfach
Germany

Kontakt
http://www.mfo.de
admin@mfo.de
Tel: +49 (0)7834 979 0
Fax: +49 (0)7834 979 38

In diesem Bericht wurde an einigen Stellen die männliche Form lediglich aus Gründen der Vereinfachung gewählt. Dies dient der besseren Lesbarkeit. Entsprechende Begriffe gelten im Sinne der Gleichbehandlung grundsätzlich für Frauen und Männer.

Jahresbericht 2016 – Annual Report 2016

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Vorwort des Direktors

2016 war ein ereignisreiches und erfolgreiches Jahr für das MFO. Die Beiträge in diesem Bericht geben einen Überblick über das vielfältige wissenschaftliche Programm und die weiteren Aktivitäten in den verschiedenen Projekten des Instituts.

Wichtigstes Ereignis im Jahr 2016 war die turnusmäßige Evaluierung des Instituts durch den Senat der Leibniz-Gemeinschaft. Ich freue mich mitzuteilen, dass unsere sechs wissenschaftlichen Hauptprogramme durch die internationale Gutachterkommission durchgehend hervorragend bewertet wurden und der Senat die Förderung des Instituts durch Bund und Länder für weitere sieben Jahre uneingeschränkt empfohlen hat. Besonders hervorgehoben wurde im Bericht der Gutachter die Professionalität und Gastfreundschaft der Mitarbeiter des Instituts. Gerne nehmen wir die Empfehlung der Gutachter an, mit dem MFO möglichst eine Vorreiterrolle bei der Förderung von mehr weiblichen Wissenschaftlern zu übernehmen. Die vollständige Stellungnahme des Senats ist auf der Webseite der Leibniz-Gemeinschaft einsehbar.

Eine besondere Anstrengung waren in 2016 auch die Maßnahmen zur Modernisierung unserer Informations- und Kommunikationsinfrastruktur, die maßgeblich mit Fördermitteln der VolkswagenStiftung umgesetzt werden konnten. Wertvolle Unterstützung hierfür kam außerdem von der Oberwolfach Stiftung und dem Förderverein. Die neuen Diskussions- und Arbeitsbereiche für kleinere Gruppen, die Videokonferenzanlage

Director's foreword

2016 was an eventful and successful year for the Mathematisches Forschungsinstitut Oberwolfach. The chapters in this report provide an overview of the varied scientific program as well as further activities of the Institute including the third-party projects.

The most important event in 2016 was the evaluation of the Institute by the senate of the Leibniz Association. I am pleased to report that the research programs of the Institute have been rated as excellent and that the senate has fully recommended the funding of the Institute by the Federal Government and the States Governments for another seven years. Special praise was given to the staff of the Institute for their professionalism and hospitality. The recommendation that the MFO should aspire to a leading role in supporting more female scientists in mathematics is gladly accepted as a challenge. The complete report of the senate is available on the website of the Leibniz Association.

I would like to give special mention to the measures for the modernization of our information and communication infrastructure which could be realized with funding from the Volkswagen Foundation. Valuable support was also provided by the Oberwolfach Foundation and the Friends of Oberwolfach. The new discussion and working spaces for smaller groups, the video conferencing system, and the improved access to

und der verbesserte Zugriff auf Literatur in der Bibliothek sind ein großer Gewinn für unsere Gäste und wurden bereits kurz nach der Fertigstellung rege genutzt. Der VolkswagenStiftung, der Oberwolfach Stiftung und dem Förderverein danke ich sehr herzlich für ihre Unterstützung in diesem Projekt.

literature in the library are great benefits for our guests and have already been used very shortly after completion. I would like to express our sincere thanks to the Volkswagen Foundation, the Oberwolfach Foundation and the Friends of Oberwolfach for their support of this project.

Einen weiteren Meilenstein stellte die Ausgründung von IMAGINARY dar. Das Projekt startete am MFO anlässlich des Wissenschaftsjahres der Mathematik 2008 als interaktive Wanderausstellung und entwickelte sich über die Jahre zu einer Online-Plattform für interaktive Mathematik-Vermittlung. Seit September 2016 ist IMAGINARY eine selbständige gemeinnützige GmbH mit einem breiten Spektrum an Dienstleistungen in der Mathematikkommunikation. In diesem Bereich wird IMAGINARY weiterhin ein wichtiger Kooperationspartner für das MFO sein. Ich danke der Klaus Tschira Stiftung sehr herzlich für die langjährige Förderung des Projekts und der Leibniz-Gemeinschaft für die Unterstützung der jungen GmbH in der Gründungsphase.

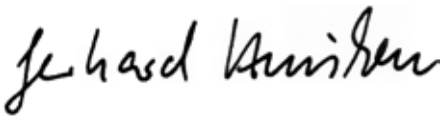
A further milestone was the spin-off of IMAGINARY. The project started at the MFO on the occasion of the science year of mathematics in 2008 as an interactive traveling exhibition and developed over the years to an online platform for interactive mathematics communication. In September 2016 IMAGINARY became an independent non-profit company offering a wide range of services in mathematics communication. Within this field IMAGINARY will continue to be an important cooperation partner of the MFO. I would like to thank the Klaus Tschira Stiftung for the long-term support of the project and the Leibniz Association for the support of the young company in its start-up phase.

Die Förderung durch Bund und Länder stellt das finanzielle Rückgrat für unsere wissenschaftlichen Programme dar. Daneben wird das Institut von weiteren Institutionen in verschiedenen Aktivitäten unterstützt. Es freut mich besonders, dass sowohl die Carl Friedrich von Siemens Stiftung als auch die National Science Foundation der USA die finanzielle Förderung des wissenschaftlichen Nachwuchses in Oberwolfach jeweils für drei bzw. fünf weitere Jahre bewilligt haben. Ebenso danke ich der Simons Foundation für die Förderung der Zusammenarbeit von Forschenden in und außerhalb Europas im Rahmen des Programms „Simons Visiting Professors".

While the federal and state governments provide the financial backbone for our scientific programs the MFO is also supported by other institutions in varied activities. I am particularly pleased that both the Carl Friedrich von Siemens Foundation and the US National Science Foundation have approved the financial support of junior scientists in Oberwolfach for another three and five years respectively. I would also like to thank the Simons Foundation for the promotion of cooperation between researchers in an outside of Europe within the program Simons Visiting Professors.

Schließlich danke ich allen ehrenamtlichen Mitgliedern in unseren verschiedenen Gremien, den Mitgliedern der Gesellschaft für Mathematische Forschung sowie unseren Mitarbeiterinnen und Mitarbeitern. Sie alle sichern durch Ihren unermüdlichen Einsatz sowohl die wissenschaftliche Qualität des Instituts als auch das Wohl unserer Gäste. Ich freue mich darauf, auch 2017 wieder mit Ihnen zusammenzuarbeiten.

Finally, I would like to thank all voluntary members in our various committees, the members of the Gesellschaft für Mathematische Forschung and our staff members. It is your untiring commitment, which ensures both the scientific quality of the Institute and the well-being of our guests. I am looking forward to cooperate with you again in 2017.



Gerhard Huisken

1. Besondere Beiträge

1.1. Modernisierung der Informations- und Kommunikationsinfrastruktur

2014 wurde auf Grundlage der 2013 durchgeführten Nutzerbefragung ein neues Bibliothekskonzept entwickelt. Dieses sieht vor, den Bestand an elektronischer Literatur kontinuierlich auszubauen, Zeitschriften in gedruckter Form allmählich auslaufen zu lassen sowie das Angebot an Diskussionsbereichen und Arbeitsplätzen für kleinere Gruppen in der Bibliothek zu erweitern. Folgende Maßnahmen waren für die Umsetzung des Konzepts vorgesehen:

- Einrichtung von drei neuen Diskussions- und Arbeitsbereichen für kleinere Gruppen
- Installation einer Videokonferenzanlage für die Gäste
- Verbesserter Zugriff auf gedruckte Information durch Umstrukturierung des Bibliothekbestands: Verlagerung der Monographien in die attraktivere Bibliothekserweiterung; Kompaktaufstellung der Zeitschriftenbände
- Umstellung von Zeitschriftenabonnements auf elektronische Lizenzierung
- Lizenzierung von E-Book-Paketen
- Aufbau eines elektronischen Zeitschriftenarchivs

Zur Finanzierung der Kompaktanlage, der Umbaumaßnahmen für die zusätzlichen Diskussionsräume sowie der Videokonferenzanlage wurde ein Förderantrag bei der Volkswagen-Stiftung gestellt. Diese bewilligte den Förderantrag in vollem Umfang mit einem Betrag von 208.900,- €. Weitere Maßnahmen wurden als Eigenleistung und mit Unterstützung der Oberwolfach Stiftung und des Fördervereins vorgenommen.

Neue Diskussions- und Arbeitsbereiche

Zunächst wurde mit den Umbaumaßnahmen im bisherigen Computerraum des MFO begonnen. Hier wurde im Dezember 2015 die Kompaktanlage für den Zeitschriftenbestand eingebaut. Im Anschluß konnte der neu geschaffene Raum im bisherigen Monographienraum mit einer schallisolierten Trennwand so umgestaltet werden, dass ein neuer Diskussionsraum entstanden ist. Im bisherigen Research in Pairs Diskussionsraum wurde eine faltbare Trennwand eingebaut. Auch dieser Einbau konnte noch im Dezember 2015 umgesetzt werden. Der Raum kann nun von zwei Diskussionsgruppen genutzt werden.

1. Special contributions

1.1. Modernisation of the information and communication infrastructure

In 2014 we developed a new concept for our library, based on a user-survey from 2013. Its intention is to continously extend the amount of electronic literature and to phase out printed journals, as well as to further increase the number of working places and discussion areas for smaller groups in the library building. The following measures are included in the concept:

- The setup of three new discussion- and working areas for smaller groups
- Installation of a videoconference system for our guests
- Improved access to printed information by restructuring the libary's stock: shifting of monographs to the more attractive library's enlargement area; compact setting of journals.
- Conversion of subscribtion journals to electronic version
- Licensing of e-book packages
- Creation of an electronic archive for journals

For financing the compact system, the refurbishment measures for additional discussion space, and the video conference system, we applied for a grant at the Volkswagen Foundation. The grant was approved over the full amount of EURO 208,900. Further measures were carried out using in-house-resources as well as with support via the Oberwolfach Foundation and the Förderverein.

New discussion and work areas

The first refurbishment measures took place at the computer room in the library building. The new compact system for journals was installed there in December 2015. Subsequently, the newly created space in the former room for monographs was rearranged to a new discussion area by the installment of a soundproof partition wall. Also, a folding partition wall was installed in the Research in Pairs room in the guest house. This measure was also carried through in December 2015; two parallel groups are now able to use this room at the same time.

Der bisherige Drucker- und Kopierraum des MFO wurde so umgestaltet, dass hier ein zusätzlicher Diskussionsraum entstehen konnte. Dazu wurde in die bestehende Tür ein Glaselement eingebaut. Die sich dort befindenden Drucker und Scanner wurden in einem nun mit einer Glastür abgetrennten Bereich beim Bibliotheksbüro untergebracht.

The former copy and printer room was also transformed into an additional discussion room. For this, the already existing door received a new glas panel. Printer and scanner were relocated to a glazed area close to the library office.

Alle neuen Diskussionsräume wurden möbliert und mit Tafeln sowie Computerarbeitsplätzen ausgestattet. Weitere Computerarbeitsplätze wurden im neuen Monographienbereich geschaffen. Zusätzliche offene Diskussionsbereiche mit Tafeln enstanden im Außenbereich. Die neu geschaffenen Räume werden von den Gästen sehr intensiv genutzt.

The new discussion areas received suitable furniture as well as blackboards and computer workplaces. Further computer workplaces were also created in the new area for monographs, additional discussion areas with blackboards were created in the outside area. These new work spaces are in high demand by our guests.

Modernisierung der Kommunikationsinfrastruktur

Für verschiedene Einsatzszenarien wurde eine mobile und flexible Videokonferenzanlage konzipiert. Sie wurde noch im Dezember 2015 beschafft und im Januar 2016 installiert. Die Anlage wird regelmäßig genutzt und findet bei den Gästen des MFO großen Anklang.

Modernisation of the communication infrastructure

A mobile and flexible system for video conferences, meeting diverse prerequisites, was aquired in December 2015 and put into operation in January 2016. The system is frequently used by our guests.

Verbesserter Zugriff auf gedruckte Information

Bedingt durch die Schaffung neuer Diskussionsbereiche war eine Umstrukturierung der Bibliotheksbereiche notwendig und damit verbunden eine umfangreiche Verlagerung der Literatur erforderlich. Die Verlagerung konnte durch ein Fachunternehmen durchgeführt werden.

Erweiterung des Angebots an elektronischer Literatur

Im Laufe der Jahre 2015/2016 wurden etwa 150 sorgfältig ausgewählte Zeitschriftenabonnements umgestellt auf rein elektronischen Bezug. Zudem wurden zusätzliche Lizenzen für etwa 80 Zeitschriften erworben. Darüber hinaus wurden E-Book-Pakete im Wert von 150.000,-€ lizenziert. Der Aufbau eines elektronischen Zeitschriftenarchivs in Kooperation mit der Technischen Informationsbibliothek (TIB) Hannover ist in Vorbereitung.

Wir danken der VolkswagenStiftung für die erneute großzügige Förderung.

Improved access to printed information

Due to the creation of new discussion areas, our library had to be restructured and a good amount of literature had to be relocated. A specialized company took good care of this task.

Enhancement of electronic literature on stock

During the course of the years 2015/2016 about 150 carefully chosen journal subscriptions were transferred to electronic import only. Furthermore, about 80 additional licenses were purchased and in addition to this, e-book packages worth the amount of about EURO 150,000.- were licensed. The setting-up of an electronic journal archive in cooperation with the Technische Informationsbibliothek Hannover (TIB) is in progress.

We very much thank the Volkswagen Foundation for their again generous support.

1.2. Experiences of an Oberwolfach Leibniz Fellow

An Interview with Eleonore Faber

MFO: Could you please shortly introduce yourself with some basic facts?

Eleonore Faber: This is a very difficult question for the start *(smiling)*. I am a mathematician, broadly speaking, my research is in algebra and I am particularly interested in all kind of singularities appearing there.

MFO: What is your current affiliation and position?

Eleonore Faber: I am a Post Doc Assistant Professor at the University of Michigan in Ann Arbor.

MFO: What is your main focus of research?

Eleonore Faber: My main research interest lies in singularity theory, using methods from commutative algebra, as well as noncommutative algebraic geometry and representation theory.

MFO: In which scientific program of the MFO do you participate?

Eleonore Faber: I am an Oberwolfach Leibniz Fellow.

MFO: How did you experience the application and organization process in preparation of your stay?

Eleonore Faber: The application itself was rather straightforward – project proposal, cv, etc. The only "complicated" part was that I had to think of a timeline since I also wanted to invite my collaborators and visit other universities.

MFO: Can you think of any hints for other applicants?

Eleonore Faber: I think one of the best parts of the Leibniz Fellow program is to invite your collaborators, and so it is a good idea to contact them as soon as possible so that there are no time conflicts.

MFO: How did you perceive the support of the MFO administration for this process?

Eleonore Faber: The guidelines on the webpage were very clear, so I didn't have any additional questions and didn't need support of the MFO administration at this stage. After I got the confirmation of my stay from the MFO administration, everything went smoothly: the communication with the MFO administration was very fast and the paperwork was negligible – thanks to the great staff at the Institute!

MFO: How did you experience your stay in Oberwolfach?

Eleonore Faber: It was a fantastic experience: doing math the whole day – and occasionally some hikes and playing the piano in between – and everything else was taken care of by the staff of the Institute! I enjoyed every minute of my stay and in the end even six weeks felt much too short.

MFO: What have been the main benefits for your work or the main outcomes, if it is possible to name them so far?

Eleonore Faber: I invited three of my collaborators and we were able to start a new project in one case and finish one in the other case: in the first two weeks of my fellowship I invited Angélica Benito and we started to work on Hasse-Schmidt derivations in positive characteristic. We did a lot of computations – it really helped to have six blackboards to do this!

Last year we spent with Ragnar Buchweitz and Colin Ingalls two weeks in the Research in Pairs program and this year we could continue our project on a McKay correspondence for reflection groups – and the proof kept getting shorter and shorter during the second stay. The work atmosphere in Oberwolfach is so calm and one can really concentrate on the mathematical problems.

Another great aspect of the Leibniz Fellowship is that I could travel to other Universities to visit other colleagues, namely to Kaiserslautern and Münster, where I could also give a seminar talk.

MFO: How did you perceive the support of the MFO administration during your stay?

E. Faber, A. Benito

R. Buchweitz, E. Faber, C. Ingalls

Eleonore Faber: I felt like at home and the administration was very efficient and swift.

MFO: How did you perceive the impact of your stays in Oberwolfach on your personal career.

Eleonore Faber: So far I have participated in Oberwolfach Workshops as well as in the RiP program and the Leibniz Fellowship. Of course, the Workshops are the best opportunity for learning new things and meeting new people and also disseminating one's results, but I think that more important for me were the longer research stays: we could really focus on doing mathematics under the best possible circumstances. The time during the fellowship when I was alone here I mostly spent writing up results and reading in the library.

MFO: It is a common phenomenon that the percentage of women in mathematics is rather small. How would you describe the situation in your field of research?

Eleonore Faber: Although there are still not very many women in my area, I think that as well in commutative algebra as in representation theory there is a growing number of female researchers. We even had a workshop with 42 only women participants in Banff earlier this year – this was an interesting experience since the atmosphere was quite different from usual conferences.

MFO: What are major reasons for the small percentage of women in mathematics, according to your opinion?

Eleonore Faber: This is a good question and I wish I had a good answer for it: from my own experience I could see that from the beginning of my studies until now the number of my female colleagues has been steadily decreasing. I think one reason is the relative job insecurity, which makes it in particular hard to start a family. Also I encountered some women with self doubts – most of the time not really justified – and the often precarious job situation for young mathematicians at Universities certainly doesn't encourage already doubting women to continue on this path.

MFO: From your point of view, what would be appropriate measures to improve the situation?

Eleonore Faber: I guess that it will take some more time to change this. I think that special programs or workshops for women certainly help to increase the number of female researchers. In particular, I think that events for school children – like the IMAGINARY exhibition – help to make people aware of science at a young age and get them interested and thus can help that more girls study mathematics.

MFO: What could Oberwolfach contribute to improve the situation for female junior researchers or for female researchers in general?

Eleonore Faber: I think Oberwolfach should encourage organizers to invite more women for the Workshops – or even try to organize a women only Workshop or Seminar. Also, during my stay here I saw that some mathematicians came with their whole families. I think one could advertise more the fact that it is possible to bring your children and even arrange daycare at the Institute. This might encourage more women with families to participate in the workshops.

MFO: Thank you very much for this conversation!

1.2. MiMa – Museum für Mineralien und Mathematik

Das Mathematische Forschungsinstitut Oberwolfach betreibt seit 2010 gemeinsam mit dem Verein der Freunde von Mineralien und Bergbau und der Gemeinde Oberwolfach das MiMa – Museum für Mineralien und Mathematik. Das Museum zeigt eine einzigartige Sammlung an Mineralien aus dem gesamten Schwarzwald und erklärt ihre kristallinen Formen und Symmetrien in interaktiven mathematischen Installationen.

Die Ausstellung der Mineralien konzentriert sich bewusst auf die Fundstellen des Schwarzwalds, um die mineralogische Vielfalt dieser Region möglichst umfassend darstellen zu können. Ein Schwerpunkt liegt auf den Mineralien der heute noch aktiven Grube „Clara" in Oberwolfach.

Der mathematische Teil der Ausstellung bietet kunstvolle Einblicke in die Mathematik und lädt dazu ein, mathematische Phänomene spielerisch zu erforschen. Sowohl Konzepte der angewandten als auch der reinen Mathematik werden in interaktiven Programmen, Hands-on-Exponaten und Bildern dargestellt. Ein deutlicher Schwerpunkt liegt auf den mathematischen Grundlagen der Kristallografie. Durch diese Verknüpfung von Mathematik und Mineralogie bietet das Museum einen interdisziplinären Zugang zu beiden Wissenschaften und vereint zwei Besonderheiten der Region unter einem Dach. Im Jahr 2016 kamen über 6000 Besucher ins MiMa.

Veranstaltungen

Im Jahr 2016 wurde die Veranstaltungsreihe „Kultur im MiMa" mit interessanten Themen fortgeführt. Am 23. März fand eine Lesung von Alfred Metzler und Thomas Hafen statt. Die beiden Kolumnisten des Offenburger Tageblatts trugen Geschichten aus ihrem Buch „Zweistimmig" vor. Corina Harter umrahmte den Abend musikalisch mit Gitarre und Gesang.

Alfred Metzler

1.2. MiMa – Museum for Minerals and Mathematics

Since 2010 the Mathematisches Forschungsinstitut Oberwolfach engages in the MiMa – Museum for Minerals and Mathematics, together with the association of the Friends of Minerals and Mining in Oberwolfach and the municipality Oberwolfach. The museum shows a one-of-a-kind collection of minerals from all over the Black Forest and explains their forms and symmetries with interactive mathematical applications.

The exhibition of minerals deliberately focuses on the sites of the Black Forest in order to present the rich diversity of the region in a maximum variety. Special emphasis is put on the minerals of the mine "Clara" in Oberwolfach, which is still active today.

The maths exhibition delivers aesthetic insights into mathematics and enables visitors to playfully explore mathematical phenomenons. Interactive programs, hands-on exhibits, and images depict concepts of both applied and pure mathematics. A clear focus is put on the mathematical foundations of crystallography. Through this combination of mathematics and mineralogy, the museum offers an interdisciplinary approach to both sciences and presents two unique features of the region in one single spot. In 2016 more than 6000 people visited the MiMa.

Events

The event series "Kultur im MiMa" continued with interesting topics. On 23 March Alfred Metzler and Thomas Hafen, two columnists of the Offenburger Tageblatt, read stories from their book "Zweistimmig" (in two voices). The event was given a musical accompaniement by the young singer-songwriter Corina Harter from Oberwolfach.

Corina Harter, Thomas Hafen

Am 8. Juni hielt der amerikanische Mathematiker Jeff Weeks einen Gastvortrag über mögliche Formen des Weltraums. Mit Hilfe spannender Gedankenexperimente und Computersimulationen veranschaulichte er die Idee eines endlichen Universums ohne Rand. Labyrinthe, Kreuzworträtsel und Puzzles auf dem 2-Torus und auf dem 3-Torus trainierten die Vorstellungskraft der Zuhörer, denen das Mitdenken und Miträtseln sichtlich Spaß bereitete.

On 8 June Jeff Weeks, an American mathematician, gave a talk about the possible forms of the universe. He presented all kinds of thought experiments and computer simulations to illustrate the idea of a finite universe without border: labyrinths, crossword and jigsaw puzzles on a 2-torus and 3-torus trained the imagination of the audience. Apparently the visitors had lots of fun with these experiments.

Jeff Weeks spielt „3 gewinnt" auf einem virtuellen 2-Torus
Jeff Weeks playing Tic Tac Toe on the 2-Torus

Eva Wohlleben

Am 7. September stellte die Künstlerin Eva Wohlleben ihre Arbeiten im MiMa vor. Eva Wohlleben hat aus zehn gleichseitigen Dreiecken einen in sich beweglichen Baustein, das sogenannte Korpuskel, entwickelt. Daraus baut sie bewegliche Skulpturen mit verblüffenden Eigenschaften. Zahlreiche der Skulpturen waren im Museum zu sehen. In einem Vortrag erläuterte die Künstlerin die besondere Geometrie der Figuren.

On 7 September the artist Eva Wohlleben presented her work at the MiMa. Eva Wohlleben has developed a flexible building block from equilateral triangles, called corpuscle. With this building block she creates flexible sculptures with astonishing properties. Many of her sculptures were exhibited. The visitors could not only see them but also touch them while Eva Wohlleben explained their special geometry.

Weitere Aktivitäten

Im Februar besuchte die Landesministerin für Wissenschaft, Forschung und Kunst, Theresia Bauer, gemeinsam mit der Landtagsabgeordneten Sandra Boser das MiMa. Bürgermeister Matthias Bauernfeind, Prof. Dr. Gerhard Huisken, Prof. Dr. Stephan Klaus und Werner Günter präsentierten in einem Rundgang das Museum und erläuterten dessen Bedeutung für die Region.

Im April begann das MiMa eine Kooperation mit dem Rittel Verlag in Hamburg. Der Verlag für mathematisches Lernmaterial bietet unter anderem Geometrie-Legespiele aus Filz an und stellte dem MiMa einige Musterexemplare sowie eine dazu passende Filztafel kostenlos zur Verfügung.

Seit Juni 2016 bietet das MiMa seinen Besuchern einen Multimediaguide zum Ausleihen an. Das System wurde am MFO entwickelt. Der Multimediaguide enthält neben Hörführungen auch

Further activities

In February Theresia Bauer, Minister of Science Research and Art in Baden-Württemberg, visited the MiMa together with Sandra Boser, member of the Landtag in Baden-Württemberg. Matthias Bauernfeind, mayor of Oberwolfach, Prof. Dr. Gerhard Huisken, Prof. Dr. Stephan Klaus and Werner Günter presented the museum and explained its significance for the region.

In April the MiMa started a cooperation with the "Rittel Verlag" in Hamburg. The publishing house for mathematical learning material offers – among other things – geometry games made of felt and provided the MiMa some sample copies as well as an appropriate board, free of charge.

Since June 2016 the MiMa offers a multimediaguide for rent to the visitors. The system was developed at the MFO. The multimediaguide contains written texts, pictures, and videos in

geschriebene Texte, Bilder und Videos und geht damit in seinen Vermittlungsmöglichkeiten weiter als ein herkömmlicher Audioguide.

Von Februar bis August beteiligte sich das MiMa an der Eröffnungsausstellung der Mathematikon Shops in Heidelberg. In einem Schaufenster des Einkaufszentrums waren in dieser Zeit die fünf Platonischen Körper und die fünf Platonischen Sterne aus dem MiMa zu sehen.

In den Monaten August und September öffnete das MiMa zusätzlich zu den normalen Öffnungszeiten jeden Donnerstag von 20:00-23:00 Uhr seine Pforten. Um 20:30 Uhr fand jeweils eine Führung statt. Die Führungen wurden von Mitgliedern des Mineralienvereins und Mitarbeitern des MFO durchgeführt.

Im Dezember erneuerte das MiMa das Mathematikexponat Carpark. Das Spielbrett und die Spielfiguren des beliebten Logikspiels waren inzwischen in die Jahre gekommen und mussten immer häufiger in Reparatur. Eine Schreinerei aus der Region wurde deshalb mit der Neugestaltung, Umsetzung und Montage des Spiels beauftragt.

addition to conventional audio guides and thus offers further didactic possibilities to explain the contents of the exhibition.

From February to August the MiMa participated in the opening exhibition of the Mathematikon Shops in Heidelberg. In a show case of the shopping center the five Platonic solids and the five Platonic stars from the MiMa could be viewed during this time.

During August and September 2016 the MiMa opened additionally every Thursday from 20:00-23:00 o'clock. At 20:30 a guided tour was offered by members of the minerals association and employees of the Mathematisches Forschungsinstitut Oberwolfach.

In December the MiMa renewed the mathematics exhibit Carpark. The board and the pawns of the popular logic game were now getting old and needed to be repaired more and more frequently. A carpenter's workshop from the region was therefore commissioned with the redesign, implementation and installation of the game.

1.3. IMAGINARY 2016

IMAGINARY begann im Jahr der Mathematik 2008 als interaktive Wanderausstellung, die mathematische Forschung auf attraktive und verständliche Weise durch Visualisierungen, interaktive Installationen, virtuelle Welten, 3D-Objekte mit ihren mathematischen Hintergründen präsentiert. Ab 2011 entwickelte IMAGINARY zusätzlich zu Ausstellungen eine open source-Plattform für interaktive Mathematikvermittlung. Das Projekt wurde von 2013 bis 2016 unter dem Titel „Oberwolfach trifft IMAGINARY" von der Klaus Tschira Stiftung gefördert.

Aufgrund des außergewöhnlich hohen Interesses an neuen Ausstellungen und Kooperationen nahm IMAGINARY am Leibniz-Wettbewerb 2016 mit dem Ziel teil, eine gemeinnützige GmbH zu gründen, um der starken Nachfrage gerecht zu werden. In der Förderlinie Wissensvermittlung und Förderung von Ausgründungen gewann IMAGINARY eine Förderung bis 2018. Damit ermöglichte die Leibniz-Gemeinschaft die Ausgründung am 23. September 2016 und gewährt mit ihren Fördermitteln einen reibungslosen Übergang in die Selbständigkeit. Der Geschäftsführer der IMAGINARY gGmbH ist Andreas Matt, das MFO als Heimatinstitut des Projekts ist weiterhin als Gesellschafter beteiligt.

1.3. IMAGINARY 2016

IMAGINARY started in 2008 as an interactive traveling exhibition that presents visualizations, interactive installations, virtual worlds, 3D-objects and their mathematical background in an attractive and understandable way. Since 2011, in addition to exhibitions, IMAGINARY has developed an open source platform for interactive and participative math communication. From 2013 to 2016, IMAGINARY was supported by the Klaus Tschira Stiftung under the name "Oberwolfach meets IMAGINARY".

Because of the extraordinary high demand for new exhibitions and cooperations, IMAGINARY participated in the Leibniz competition 2016 with the goal to found a non-profit organization, in order to be able to meet these high expectations. Within the line of funding for science communication and promotion of the founding of new companies and organizations IMAGINARY received a grant until 2018. This way, the Leibniz Association provides the financial basis of the spin-off process and ensures a smooth transition into an independent organization. On September 23, 2016 the non-profit organization IMAGINARY gGmbH was founded. The managing director of IMAGINARY gGmbH is Andreas Matt. The MFO is a shareholder of IMAGINARY gGmbH.

Die Plattform „IMAGINARY – open mathematics" bietet einen Ort für die Präsentation und Entwicklung interaktiver Mathematikexponate und -ausstellungen. Alle IMAGINARY-Aktivitäten werden dort dokumentiert, alle IMAGINARY-Inhalte unter einer freien Lizenz zur Verfügung gestellt und können so leicht für eigene Ausstellungen und Veranstaltungen verwendet werden. Darüber hinaus bietet die Plattform allen Benutzerinnen und Benutzern die Möglichkeit, mit eigenen Inhalten beizutragen und dient so als Basis für den Austausch innerhalb der mathematischen Community, besonders in der Mathematikvermittlung.

The platform "IMAGINARY – open mathematics" provides a space for the presentation and development of exhibits such as interactive programs, images, 3d prints, etc and for mathematics exhibitions that showcases these things. All contents of IMAGINARY are made available to a broad audience under a free license and can thus be reproduced and used for individual exhibitions and events. The platform provides an opportunity for everyone interested to contribute with their own material and serves as a hub for exchange of ideas in the field of math communication.

Die IMAGINARY-Ausstellungsaktivitäten und Kooperationen

Im Jahr 2016 hat IMAGINARY 67 Ausstellungen und Veranstaltungen organisiert bzw. daran teilgenommen, welche alle auf der Plattform zugänglich und übersichtlich gespeichert sind (www.imaginary.org). Neben einer Beschreibung gibt es zu jedem Event Fotos - für einige Ausstellungen auch Videos und weitere Zusatzmaterialien.

The IMAGINARY exhibition events and collaborations

In 2016, IMAGINARY organized 67 exhibitions and events which are easily accessible for everyone through the database on the website www.imaginary.org. Usually, events will have a short description but also other media such as photographs, or even videos summarizing each event.

Höhepunkte des IMAGINARY-Jahres waren die Eröffnung des Mathematikon Shoppingcenters in Heidelberg, IMAGINARY beim Next Einstein Forum in Senegal, die IMAGINARY Konferenz IC16 in Berlin und der Beginn der Wanderausstellung durch die Niederlande.

IMAGINARY highlights of the year 2016 were the opening of the Mathematikon shopping center in Heidelberg, Germany, IMAGINARY at the Next Einstein Forum in Senegal, the IMAGINARY conference IC16 in Berlin, Germany, as well as the launch of the IMAGINARY traveling exhibition touring the Netherlands.

Nachfolgend stellen wir einen Großteil unserer Ausstellungs- und Veranstaltungsaktivitäten einzeln vor:

In the following, most of our events with respect to exhibitions and collaborations are listed:

Belgien. Die IMAGINARY-Wanderausstellung reiste auch im Jahr 2016 weiter durch Belgien. Sie wurde von der Vlaamse Wiskunde Olympiade (Flanders Mathematics Olympiad) in Zusammenarbeit mit den Universitäten in Flandern geplant. Mehrere Ausstellungen fanden in Belgien statt, mit 35 mathematischen Bildern, zwölf 3D-Drucken mathematischer Objekte und fünf großen Touch-Screens mit interaktiver Software. Eine eigene belgische Webseite wurde für die Ausstellungen erstellt.

Belgium. The traveling IMAGINARY exhibition continued to show in several Belgian cities. It is an initiative of the Vlaamse Wiskunde Olympiade (Flanders Mathematics Olympiad) in cooperation with the universities in Flanders. The exhibition featured over 35 mathematical gallery prints, 12 3D-prints of mathematical objects and five large touch screens offering interactive software to the audience. There is also a Belgian website for these exhibitions.

Mathematikon Heidelberg. Im Februar 2016 eröffnete in Heidelberg das Mathematikon Shoppingcenter. Die mathematischen Inhalte hat IMAGINARY unter Mithilfe der bestehenden internationalen Community der IMAGINARY-Plattform und des Netzwerks des Projekts entwickelt. Mathematiker aus 14 Ländern waren daran beteiligt.

Mathematikon Heidelberg, Germany. In February 2016, the Mathematikon shopping center was inaugurated. IMAGINARY and its international community developed the mathematical content with mathematicians from 14 different countries involved.

IMAGINARY-Ausstellung in Nürnberg (Autor: Torsten Stier)
IMAGINARY exhibition in Nuremberg (author: Torsten Stier)

Kassenband im Mathematikon Einkaufszentrum, Heidelberg
Conveyor belt in the Mathematikon Shopping Center, Heidelberg

Türkei. Die 2015 für das Deutsch-Türkische Wissenschaftsjahr entwickelte IMAGINARY-Wanderausstellung, reiste in weitere türkische Städte, darunter Adana und Ankara.

Turkey. The IMAGINARY exhibition was developed in 2015 for the German-Turkish science year and was shown in more Turkish cities in 2016, for example in Adana and Ankara.

MPE. Seit März 2016 läuft ein internationaler Wettbewerb für neue Ausstellungsexponate zum Thema Mathematik des Planeten Erde (MPE). Die Deadline ist der 30. Juni 2017. Eine internationale Jury wird alle Einreichungen bewerten und die besten Module prämieren, sodass die Gewinner die bestehende MPE-Ausstellung bereichern. Die Partnerorganisationen des Wettbewerbs sind neben IMAGINARY, UNESCO, die International Mathematical Union (IMU) und die International Commission on Mathematical Instruction (ICMI). Die IMAGINARY Plattform dient dem Upload aller eingereichten Ausstellungsmodule.
https://imaginary.org/mpe-competition

MPE. In March 2016, the international competition for new exhibition modules started. The general topic is Mathematics of Planet Earth (MPE), the deadline is June 30, 2017. An international jury will evaluate all submissions, the best modules will be awarded and integrated into the existing MPE exhibition. The competition is jointly organized by UNESCO, the International Mathematical Union (IMU), the International Commission on Mathematical Instruction (ICMI) and IMAGINARY. The IMAGINARY platform will host all submitted exhibition modules:
https://imaginary.org/mpe-competition

München/Heidelberg. In Zusammenarbeit mit dem Heidelberger Institut für Theoretische Studien (HITS) entwickelt IMAGINARY eine Software-Infrastruktur für das neue Astronomiemuseum ESO Supernova in München, das 2017 eröffnet wird. Die Infrastruktur baut auf dem dynamischen Museumssystem auf, das für Ausstellungen entwickelt wurde, und durch zusätzliche Kontroll- und Managementwerkzeuge erweitert wird.

Munich/Heidelberg, Germany. In collaboration with the Heidelberg Institute for Theoretical Studies (HITS), IMAGINARY is developing a software infrastructure for the new Astronomy museum ESO Supernova in Munich. It will be opened in 2017. The infrastructure is based on the dynamic museum system, developed for exhibitions and will include additional monitoring and power management tools.

Senegal. IMAGINARY ist Partner des Next Einstein Forums (NEF) und war mit einer Ausstellung auf dem ersten Forum in Senegal vertreten. Afrikanische und internationale Wissenschaftler entwickelten und präsentierten dort mathematische Bilder, Filme und interaktive Programme zu moderner Mathematik.

Senegal. IMAGINARY is partner of the Next Einstein Forum (NEF) and organized an exhibition at the first Forum in Senegal featuring images, films and digital interactives of modern mathematics, developed and presented by African and international scientists.

Taiwan. Nach der ersten großen IMAGINARY-Ausstellung im National Science and Technology Museum in Kaohsiung in Taiwan, die von der Mathematischen Gesellschaft Taiwans in Zusammenarbeit mit IMAGINARY kuratiert wurde,

Taiwan. After the first important IMAGINARY exhibition at the National Science and Technology Museum in Kaohsiung, Taiwan, which was curated by the Mathematical Society of Taiwan in collaboration with IMAGINARY, more large

folgten weitere große Ausstellungen im März 2016 im National Taiwan Science and Education Center in Taipei und im Mai 2016 an der National Chiayi Universität. Außerdem entstand eine kleinere Wanderausstellung, die seitdem an dreizehn taiwanesischen High Schools gezeigt wurde und auch in Zukunft an weiteren Schulen gastieren wird.

exhibitions were organized, in March 2016 at the National Taiwan Science and Education Center in Taipei and in May 2016 at the National Chiayi University. Additionally, an exclusively created small travelling exhibition has visited 13 Taiwanese high schools so far and more are planned for the future.

IMAGINARY beim Next Einstein Forum in Senegal
IMAGINARY at the Next Einstein Forum in Senegal

IMAGINARY-Ausstellung in Chiayi, Taiwan
IMAGINARY exhibition in Chiayi, Taiwan

Kroatien. Der Fachbereich Mathematik der Universität Rijeka in Kroatien organisierte einen online SURFER Wettbewerb. Die Gewinner des Wettbewerbs wurden auf dem Wissenschaftskolloquium der Gesellschaft für Mathematik und Physik in Rijeka geehrt. Als Abschluss folgte eine IMAGINARY-Ausstellung in Zagreb im Dezember 2016.

Croatia. The Department of Mathematics, University of Rijeka, Croatia, organized an online SURFER competition. Winners of the competition were announced at the scientific colloquium of the Society of the mathematicians and physicists in Rijeka. In December 2016, an IMAGINARY exhibition was presented in Zagreb.

China. Im Mai 2016 eröffnete eine IMAGINARY-Ausstellung an der Xi'an Jiaotong Liverpool University in Suzhou, China. Bereits 2012 fand hier die erste IMAGINARY-Ausstellung statt. Teile der neuen Ausstellung wurden inzwischen auch an anderen Orten in China gezeigt, weitere Veranstaltungen sind geplant.

China. In May 2016, the IMAGINARY exhibition's inauguration at Xi'an Jiaotong Liverpool University in Suzhou, China, took place. At this location, an earlier version of IMAGINARY was already presented in 2012. Parts of the new exhibition have been shown in different Chinese locations later in 2016 and additional IMAGINARY events are being planned.

IMAGINARY-Ausstellung in Suzhou, China
(Autorin: Jessica Wieczorek)

IMAGINARY exhibition in Suzhou, China
(author: Jessica Wieczorek)

Serbien. Im Mai 2016 war IMAGINARY Teil der Ausstellung, die zu Ehren des 70. Jahrestages des mathematischen Instituts der Serbischen Akademie der Wissenschaften und der Künste stattfand. Im interaktiven Bereich der Ausstellung konnten Besucher mit den interaktiven IMAGINARY-Programmen interagieren.

Serbia. In May 2016, IMAGINARY was part of the exhibition regarding the 70th anniversary of the Mathematical Institute of the Serbian Academy of Sciences and Arts. Within the interactive part, visitors can get acquainted with the IMAGINARY programs.

Nürnberg. Im Juni/Juli 2016 fand eine große IMAGINARY-Ausstellung im Glasbau des Künstlerhauses in Nürnberg statt. Auf mehreren Etagen wurden großformatige mathematische Bilder, interaktive Software-Exponate, hands-on Objekte, ein quasiperiodisches Magnet-Puzzle, Filme und illustrierte Texttafeln zu den vier großen Themen der Ausstellung gezeigt: Algebraische Flächen, Fraktale, Polyeder – Kristalle – Quasikristalle und angewandte Geometrie.

Nuremberg, Germany. In June/July 2017, a large scale IMAGINARY exhibition was presented at the so-called 'Glasbau des Künstlerhauses' in Nuremberg, Germany. Distributed over several floors the exhibition consisted of a mathematical image gallery, interactive software programs, hands-on exhibits, a quasi-periodic magnetic puzzle, films and illustrated text boards. The four major topics were: Algebraic surfaces, fractals, polyhedra – crystals – quasicrystals and applied geometry.

Kaiserslautern. Eine IMAGINARY-Ausstellung und ein -Workshop fanden im Juli 2016 zum Tag der Mathematik an der Technischen Universität in Kaiserslautern statt. Beides richtete sich an Schüler der Gymnasialstufe, Studenten sowie Lehrer und Eltern. Einige klassische IMAGINARY-Bilder zieren seitdem dauerhaft das Universitätsgebäude.

Kaiserslautern, Germany. An IMAGINARY exhibition and workshop at the Day of Mathematics at Technical University of Kaiserslautern in July 2016 focused on high school and university students of all ages, as well as teachers and parents. Some IMAGINARY images are now permanently installed in the university building.

Österreich. IMAGINARY nahm mit dem Workshop "IMAGINARY - Mathematik, Kunst und Musik selbst gemacht!" für Kinder im Alter von 10-14 Jahren an der KinderuniKunst in Wien teil.

Austria. IMAGINARY offered the Workshop "IMAGINARY - Mathematik, Kunst und Musik selbst gemacht!" for kids age 10 to 14 years at the KinderuniKunst in Vienna, Austria.

IC16 Berlin. Im Juli 2016 fand die erste IMAGINARY-Konferenz in Berlin statt, die von der VolkswagenStiftung gefördert wurde. Zum Thema offene und kollaborative Kommunikation mathematischer Forschung versammelten sich 162 WissenschaftlerInnen, KommunikatorInnen und andere Interessierte aus 42 Ländern, um ihre Ideen zu präsentieren und sich auszutauschen. Viele Teilnehmer kamen aus den Reihen der internationalen IMAGINARY-Community. Ein Panel wurde zum Thema „IMAGINARY around the world" veranstaltet mit Vorträgen und Diskussionsbeiträgen über Erfahrungen mit IMAGINARY in den verschiedensten Ländern. „Snapshots of modern mathematics" präsentierten sich in einem eigenen Vortrag. Das Konferenzprogramm war eine Mischung aus konventionellen Vorträgen und praktischen Workshops mit konkreten Resultaten.

IC16 Berlin, Germany. In July 2016, the first IMAGINARY conference took place in Berlin, sponsored by the Volkswagen Foundation. The general topic of the conference was open and collaborative mathematics communication. 162 scientists, communicators and other interested participants gathered from 42 different countries to present and share their ideas. Many participants originated from the international IMAGINARY community. A special panel with focus on "IMAGINARY around the world" was organized with talks and discussions on the experiences with IMAGINARY in the different parts of the world. One of the talks of the general program presented the "Snapshots of mathematics". The conference program comprised a mixture of traditional talks and practical workshops with concrete outputs.

Bridges Finnland. Im August 2016 hat IMAGINARY mit mehreren Beiträgen an der Bridges Konferenz in Jyväskylä, Finnland, teilgenommen. Ein short paper war Teil des Vortragsprogramms, zwei Bilder wurden in der Kunstgalerie ausgestellt, es gab einen mehrstündigen Workshop von IMAGINARY am Bridges Family Day

Bridges Finland. In August 2016, IMAGINARY contributed to the Bridges conference in Jyväskylä, Finland, in several ways. A short paper was part of the presentations program, two mathematical images were exhibited in the art gallery, there was a half-day IMAGINARY workshop as part of the Bridges Family Day, and a SURFER

und eine SURFER-Animation wurde auf dem Bridges Short Movie Festival gezeigt.

Niederlande. Die IMAGINARY-Wanderausstellung für die Niederlande eröffnete im September 2016 in Eindhoven. Sie wurde von platform wiskunde nederland und der Universität Utrecht organisiert, wobei die ins Niederländische übersetzten Inhalte von der Belgischen Wanderausstellung übernommen werden konnten. Bis Juni 2017 wird sie noch in 5 weiteren großen Städten gastieren. Es wurde eine eigene Webseite dafür in der Landessprache eingerichtet.

video animation was screened in the Bridges Short Movie Festival.

Netherlands. The IMAGINARY traveling exhibition in the Netherlands was inaugurated in September 2016 in Eindhoven. It was organized by platform wiskunde nederland and the University of Utrecht. Dutch translations of content could be used from the Belgian traveling exhibition. The exhibition will be shown in five more cities. A website is hosted in Dutch to follow along the activities and content of the exhibition.

IMAGINARY-Workshop beim Bridges Family Day
IMAGINARY workshop at Bridges Family Day

Eröffnung der Niederländischen Wanderausstellung in Eindhoven, Vortrag von Gert-Martin Greuel.
Opening of the traveling exhibition in Eindhoven, Netherlands, talk by Gert-Martin Greuel.

Portugal. Die erfolgreiche Ausstellung Formas & Fórmulas ist als Ableger aus der IMAGINARY-Ausstellung entstanden. Sie ist nun in das Foyer der Wissenschaftsfakultät der Universität Lissabon eingezogen, nachdem sie vier Jahre lang im hiesigen Wissenschaftsmuseum gezeigt wurde.

Portugal. The successful exhibition Formas & Fórmulas originated as a "spin-off" of the IMAGINARY exhibition. It found a new home at the hall of the Science Faculty of the University of Lisbon after four years on display at the Science Museum of Lisbon.

Uruguay. Die erfolgreiche IMAGINARY-Wanderausstellung reist weiter durch Uruguay. Im November 2016 machte sie Station in Dolores sowie in Carmelo. Weitere Ausstellungen sind in Planung.

Uruguay. The successful IMAGINARY exhibition continues to travel through Uruguay. In November 2016, it was presented in Dolores and Carmelo, Uruguay. Additional exhibitions are being planned.

Spanien. Die etablierte, spanische IMAGINARY-Ausstellung gastierte außerdem in Almeria und setzt damit die gelungene Zusammenarbeit von RSME und IMAGINARY fort.

Spain. The spanish IMAGINARY exhibition was presented in Almeria, continuing the favorable collaboration between RSME and IMAGINARY.

Frankreich. Zwei IMAGINARY-Exponate werden im Palais de la découverte in Paris, Frankreich, als Teil der neuen Ausstellung zu Wahrscheinlichkeit und Statistik gezeigt: Das Doppelpendel und der Kreis-Spiegel-Flipper. Beide Exponate stammen aus der Cinderella Suite.

France. Two exhibits of IMAGINARY are on display at the Palais de la découverte in Paris, France, as part of the new probability and statistics exhibition: the double pendulum and the circular mirrors flipper. Both are part of the Cinderella suite.

Schnappschüsse moderner Mathematik aus Oberwolfach

Ein wichtiger Teil von „Oberwolfach trifft IMAGINARY" sind weiterhin die „Schnappschüsse moderner Mathematik aus Oberwolfach". Darin werden hochwertige Inhalte für die Mathematik-Kommunikationsplattform IMAGINARY mittels der Teilnehmerinnen und Teilnehmer des wissenschaftlichen Programms am MFO gesammelt.

Die von den Organisatorinnen und Organisatoren ausgewählten Schnappschüsse beschreiben ein wissenschaftliches Thema im Zusammenhang mit einem Workshop am MFO. Sie sind etwa 8 bis 12 DIN A5-Seiten lang und werden in deutscher oder englischer Sprache verfasst.

Der Direktor des MFO spricht die Tagungsleiter während der Workshops auf die Schnappschüsse an. Das Projekt wird von JProf. Carla Cederbaum koordiniert. Sie ist auch als Chefeditorin für das Editieren der Texte verantwortlich. 2016 haben Prof. Andrew Cooper, Dr. Moritz Firsching, Sophia Jahns, Daniel Kronberg, Johannes Niediek und Sabiha Tokus Schnappschüsse editiert.

Zielpublikum der Schnappschüsse sind Mathematiklehrkräfte, Wissenschaftsjournalistinnen und -journalisten, Studierende und begabte Schülerinnen und Schüler sowie andere Interessierte. Das Schnappschuss-Projekt hat zum Ziel, Verständnis von und Wertschätzung für moderne Mathematik und mathematische Forschung bei einem breiten Interessentenkreis weltweit zu fördern. Im Laufe des Jahres 2016 wurden 15 Schnappschüsse sowohl auf der IMAGINARY-Plattform als auch auf der Webseite des MFO publiziert.

Snapshots of modern mathematics from Oberwolfach

The "snapshots of modern mathematics from Oberwolfach" continue to be an important part of "Oberwolfach meets IMAGINARY". Within this project, high-quality content for the mathematics communication platform IMAGINARY is collected from the participants of the scientific programs in Oberwolfach.

Snapshots selected by the organizers of the scientific programs address a topic that is related to a research topic of a Workshop at the MFO. They are 8 to 12 DIN A5 pages long and are written in English or German.

The director of the MFO addresses the workshop organizers with respect to the snapshots. The project is coordinated by JProf. Carla Cederbaum. As senior editor, she is also responsible for the editing process of the snapshots. In 2016, Prof. Andrew Cooper, Dr. Moritz Firsching, Sophia Jahns, Daniel Kronberg, Johannes Niediek, and Sabiha Tokus acted as junior editors.

The targeted readership consists of mathematics teachers, science journalists, undergraduates, advanced high school students and the interested public. The snapshot project is designed to promote the understanding and appreciation of modern mathematics and mathematical research in the interested public worldwide. In 2016, 15 snapshots were published on the IMAGINARY platform as well as on the MFO website.

Die IMAGINARY-Netzwerkinitiativen

Das Netzwerk für Mathematik-Kommunikation „IMAGINARY math communication network" wurde weiter ausgebaut. Der Austausch von Erfahrungen und Ideen zwischen den Teilnehmenden ist in regem Gange. Ein spezieller Newsletter erscheint alle zwei Monate. Das Medienwiki, in dem alle Aktivitäten im Bereich Mathematik-Kommunikation gesammelt werden, beinhaltet vergangene und aktuelle Projekte, Personen, Ausstellungen, Museen, Medien und Publikationen aller Art.

Die Teilnahme an Konferenzen trägt zum Ausbau des Netzwerks bei.

Matrix Konferenz. IMAGINARY hat mit einer Delegation an der alle zwei Jahre stattfindenden MATRIX Konferenz in Leeds teilgenommen, zu deren Themen die öffentliche Wahrnehmung

The IMAGINARY network initiatives

The "IMAGINARY math communication network" is being extended. The exchange of experiences and ideas between the participants operates fluently. A special network newsletter is issued every other month. The media wiki collects all math communications activities, including past and future project, people, exhibitions, museums, media and publications of all kinds.

Participating in conferences contributes to the strength of the network:

Matrix conference. IMAGINARY participated in the bi-annual MATRIX conference in Leeds with several team members, the topic of the conference includes public awareness and

und Vermittlung der Mathematik, Ressourcen und Informationsaustausch gehörten.

7ECM. IMAGINARY beteiligte sich am 7th European Congress of Mathematics in Berlin mit einem Vortrag in der Session zu Public Awareness of Mathematics der Europäischen Mathematischen Gesellschaft. Außerdem gab es eine gemeinsame Ausstellung von IMAGINARY und "Views in 3-Manifolds" als Teil des Kulturprogramms des Kongresses.

ICME13. Auch am 13th International Congress on Mathematical Education (ICME) in Hamburg war IMAGINARY dabei und präsentierte das Thema kollaborative Mathematik-Kommunikation in dem Vortrag "Popularization of Mathematics Study Group".

Bridges. Wie oben bereits erwähnt, war IMAGINARY aktiver Bestandteil der Bridges Konferenz an der Universität Jyväskylä in Finnland.

ESMA. Auf der internationalen Konferenz der European Society for Mathematics and the Arts (ESMA), die 2016 in Ljubljana in Slowenien stattfand, präsentierte IMAGINARY "Mathematical Images in Art and Communication".

Leibniz MMS-Tage. Im Januar 2016 hielt Dietmar Kröner, stellvertretender Direktor des Mathematischen Forschungsinstituts Oberwolfach, einen Vortrag beim Netzwerk "Mathematical Modeling and Simulation" indem er IMAGINARY-Exponate mit Bezug zu mathematischem Modellieren und Simulationen vorstellte (darunter zum Beispiel das interaktive Exponat Dune Ash).

Goethe-Universität, Frankfurt am Main. IMAGINARYs wissenschaftlicher Berater Gert-Martin Greuel hielt einen Vortrag als Beitrag zur Ringvorlesung zum übergeordneten Thema Unendlichkeit, die vom Verein zur Förderung der Mathematik an der Goethe-Universität organisiert wurde. Der Vortrag enthielt etliche Illustrationen, die mit dem SURFER-Programm von IMAGINARY erstellt wurden.

Prager Wissenschaftsmesse. Zum zweiten Mal stellte die Tschechische Akademie der Wissenschaften IMAGINARY-Inhalte auf dem Stand der Prager Wissenschaftsmesse 'Veletrh vědy' für Schülerinnen und Schüler aus.

Glasgow Science Festival. Im Juni 2016 war IMAGINARY ebenfalls mit einem Messestand auf dem 10. Jahrestag des Glasgow Wissenschaftsfestivals der Universität Glasgow vertreten.

Korea Edu-Donation Messe. Das National Institute for Mathematical Sciences (NIMS)

communication of mathematics, resources and exchange of information.

7ECM. IMAGINARY contributed to the 7th European Congress of Mathematics in Berlin with a talk within the session Public Awareness of Mathematics in the European Union. Additionally, IMAGINARY presented an exhibition together with "Views in 3-Manifolds" as part of the cultural program of the congress.

ICME13. IMAGINARY also participated in the 13th Congress on Mathematical Education in Hamburg, Germany, with a talk on collaborative mathematics communications within the "Popularization of Mathematics Study Group".

Bridges. As mentioned above, IMAGINARY contributed to the Bridges conference at the University of Jyväskylä, Finland.

ESMA. At the international conference of the European Society for Mathematics and the Arts (ESMA) 2016 in Ljubljana, Slovenia, IMAGINARY presented a talk on mathematical images in art and communication.

Leibniz MMS Days. In January 2016, Dietmar Kröner, vice director of the Mathematisches Forschungsinstitut Oberwolfach, presented a talk at the Leibniz Network "Mathematical Modeling and Simulation" featuring IMAGINARY exhibits related to mathematical modeling and simulations (among them for example the interactive exhibit Dune Ash).

Goethe University, Frankfurt, Germany. IMAGINARY's scientific advisor, Gert-Martin Greuel, presented a talk using IMAGINARY's SURFER program for illustrations, which was part of a series of lectures by different speakers on the general topic of infinity. It was organized by the Verein zur Förderung der Mathematik at Goethe-Universität.

Prague Science Fair. For the second time, Czech Academy of Sciences presented IMAGINARY content in their booth at the Prague Science Fair 'Veletrh vědy' for school kids.

Glasgow Science Festival. In June 2016, IMAGINARY also had a booth at the 10th anniversary of the Glasgow science festival at the University of Glasgow.

Korea Edu-Donation Fair. The National Institute for Mathematical Sciences (NIMS)

präsentierte IMAGINARY 2016 auf der Korea "Edu-Donation" Messe, die größte nationale Bildungsmesse in Korea.

MoMath Encounters. IMAGINARY-Inhalte und -Ideen wurden im Museum of Mathematics (MoMath) in New York, USA, als Teil der Eventserie "MoMath Encounters" vorgestellt. Es handelt sich dabei um öffentliche Präsentationen, die die wunderbare Welt der Mathematik hervorheben.

STATE Festival. IMAGINARY erschuf die interaktive Installation "Promoting Cuddles" für das STATE Festival Berlin, ein Event für und mit Experten und aufstrebenden Kreativen aus den Bereichen Wissenschaft, Kunst und Kultur.

Festival der Mathematik, Chile. Im Dezember 2016 hat IMAGINARY am Festival der Mathematik in Valparaiso, Chile, teilgenommen.

presented IMAGINARY at the 2016 Korea "Edu-Donation" fair, the largest nationwide education fair in Korea.

MoMath Encounters. IMAGINARY and its ideas were presented at the Museum of Mathematics (MoMath) in New York, USA, as part of the MoMath Encounters, which is a public presentation series celebrating the spectacular world of mathematics.

STATE Festival. IMAGINARY created an interactive installation called 'promoting cuddles' at the STATE Festival in Berlin, Germany, an event involving experts and upcoming creatives from the fields of science, art and culture.

Festival de Matematicas, Chile. IMAGINARY took part in the Festival de Matematicas in Valparaiso, Chile, in December 2016.

IMAGINARY Konferenz 2016, SURFER Workshop (Autorin: Jessica Wieczorek)
IMAGINARY conference 2016, SURFER workshop (author: Jessica Wieczorek)

Der Snapshot Slider präsentiert auf der IMAGINARY-Ausstellung beim 7ECM in Berlin.
The snapshot slider presented at the IMAGINARY exhibition at 7ECM in Berlin, Germany

Neue Inhalte

IMAGINARY entwickelt und verbreitet Exponate. Besonders neue Inhalte sind wertvoll für die Mathematikkommunikation, die IMAGINARY weltweit voran bringt. Viele der IMAGINARY-Inhalte kommen aus der internationalen Gemeinschaft. Jeder Nutzer kann seine Inhalte auf der IMAGINARY-Plattform präsentieren. Einige Exponate sind Eigenentwicklungen von IMAGINARY. Im Folgenden möchten wir die drei entscheidendsten Neuerungen vorstellen:

MatchTheNet. Das Programm MatchTheNet ging 2016 online. Die Idee dazu entstand bei einem IMAGINARY-Workshop in Oberwolfach, gemeinsam mit Prof. Dr. Michael Joswig, Technische Universität Berlin. MatchTheNet ist ein Solitär-Spiel, in dem es um dreidimensionale Polytope und deren Netze geht. Es basiert auf der open source-Software polymake, die an der

New Content

IMAGINARY develops and distributes exhibits. New content is especially valuable for mathematics communication, which IMAGINARY is promoting all over the world. Many of the IMAGINARY exhibits are contributions from the community. Users can present their content at the IMAGINARY platform. Some exhibits are in-house productions of IMAGINARY. We present the three most essential innovations below.

MatchTheNet. The software MatchTheNet was launched in 2016. It is based on an idea which came up in an IMAGINARY workshop in Oberwolfach together with Prof. Dr. Michael Joswig of TU Berlin. MatchTheNet is a game about 3-dimensional polytopes and their nets. It is based on polymake, which is an open source software developed at TU Berlin. The software is available

Technischen Universität Berlin entwickelt wurde. Das Programm ist auf der IMAGINARY Plattform verfügbar und wurde bereits international auf Ausstellungen (z. B. bei der Ausstellung am 7th European Congress of Mathematicians 7ECM im Juli 2016 in Berlin), bei Events (z. B. einem Vortrag im Museum of Mathematics in New York im November 2016, siehe oben) und in Museen (z. B. dem Maison de Fermat bei Toulouse) gezeigt. Es ist auf Deutsch und Englisch verfügbar, weitere Übersetzungen sind geplant.

Snapshot Slider. Der Snapshot Slider wurde ebenfalls im Jahr 2016 entwickelt. Das Programm stellt alle Snapshots auf einem Touchscreen bereit, wobei der Benutzer durch horizontales Scrollen ("Wischen") zwischen den verschiedenen Snapshots wählen kann, während vertikales Scrollen das Lesen eines mehrseitigen Artikels ermöglicht. Jeder Snapshot kann auf Knopfdruck vor Ort ausgedruckt werden, das PDF-file kann per Email verschickt werden oder über einen QR-code mobil erreicht werden. Der Snapshot-Slider wird sowohl in temporären als auch permanenten Ausstellungen gezeigt, z. B. in der Dauerausstellung "Mind and Shape" im Foyer der Universität Tübingen.

MathLapse. MathLapse ist ein neues Format für sowohl bildungsrelevante als auch künstlerische Inhalte - kurze, einfache und kreative Videos, die eine einzelne mathematische Idee durch reale oder virtuelle Bilder verständlich machen. Die Jury des internationalen MathLapse-Wettbewerbs begutachtete etwa 50 Einreichungen, welche alle auf der IMAGINARY-Plattform präsentiert werden (www.imaginary.org/mathlapse). Auf dem MathLapse-Festival, einer Satelliten-Veranstaltung der IMAGINARY-Konferenz 2016, wurden am 22. Juli in Berlin die Sieger-Filme und die besten Einreichungen öffentlich aufgeführt.

Das Team

Hinter dem Projekt IMAGINARY steht ein internationales Team, das an der Umsetzung der einzelnen Projekte arbeitet. Besonderer Dank gilt daher (in alphabetischer Reihenfolge): Albert Haase, Andreas Matt, Antonia Mey, Bianca Violet, Carla Cederbaum, Christian Stussak, Daniel Ramos, Eric Londaits, Gert-Martin Greuel, Nadja Pernat, Norman Friedenberger, Oleksandr Motsak und Robert Wöstenfeld. Die Hilfe der lokalen Partner in den verschiedenen Ländern sowie die immer weiter wachsende IMAGINARY-Gemeinschaft machen das Projekt überhaupt möglich.

at the IMAGINARY platform and has already been part of international exhibitions (e.g. the exhibition at the 7th European Congress of Mathematicians 7ECM in July 2016 in Berlin, Germany), was used in events (e.g. in a talk at the Museum of Mathematics in New York, USA, in November 2016) and is permanently installed in museums (e.g. in the Maison de Fermat near Toulouse, France). It is available in English and German, further translations are planned.

Snapshot Slider. Developed in 2016 as well, the snapshot slider software provides all snapshots on a touch screen, the user may choose between different snapshots by sliding horizontally, while sliding vertically allows reading the several pages of a specific snapshot. Each snapshot can be printed on site via a button within the snapshot slider. The pdf file can also be sent by email or is available on mobile devices via a QR code. The snapshot slider is part of temporary as well as permanent exhibitions, such as the permanent "Mind and Shape" exhibition in the hall the University in Tübingen, Germany.

MathLapse. A "MathLapse" is a new educational and artistic format, a short, simple, and creative video illustrating a single mathematical idea through true or virtual animated images. The jury of the international MathLapse competition evaluated about 50 submissions, which are all presented at the IMAGINARY platform. As a satellite event of the IMAGINARY conference 2016, the winners and best contributions of the competition were publicly screened at the MathLapse Festival on July 22 in Berlin, Germany.

The Team

Behind the IMAGINARY project is an international team that puts all the different projects into effect. Special thanks go to (in alphabetical order): Albert Haase, Andreas Matt, Antonia Mey, Bianca Violet, Carla Cederbaum, Christian Stussak, Daniel Ramos, Eric Londaits, Gert-Martin Greuel, Nadja Pernat, Norman Friedenberger, Oleksandr Motsak and Robert Wöstenfeld. However, only through the endless support and help of all the local partners in the different countries as well as of the fast-growing IMAGINARY community, is it possible to have a successful IMAGINARY in the first place.

1.4. Oberwolfach Vorlesung 2016

Im Jahr 2016 wurde die Oberwolfach Vorlesung von Prof. Dr. Camillo de Lellis gehalten. Ein herzliches Dankeschön dafür!

1.4. Oberwolfach Lecture 2016

In 2016 the Oberwolfach Lecture was given by Prof. Dr. Camillo de Lellis. A big thank you for this!

THE NASH–KUIPER THEOREM, THE ONSAGER CONJECTURE AND THE BORISOV–GROMOV PROBLEM

CAMILLO DE LELLIS

Let (Σ^n, g) be a smooth n-dimensional Riemannian manifold. A map $u : \Sigma \to \mathbb{R}^N$ is *isometric* if it preserves the length of curves, i.e. if

$$\ell_g(\gamma) = \ell_e(u \circ \gamma) \qquad \text{for any } C^1 \text{ curve } \gamma \subset \Sigma, \tag{1}$$

where $\ell_g(\gamma)$ denotes the length of γ with respect to the metric g:

$$\ell_g(\gamma) = \int \sqrt{g(\gamma(t))[\dot\gamma(t), \dot\gamma(t)]}\, dt\,. \tag{2}$$

As customary, in local coordinates we can express the metric tensor g as[1] $g = g_{ij} dx_i \otimes dx_j$. For a C^1 map v, condition (1) is equivalent to the system of partial differential equations

$$\partial_i u \cdot \partial_j u = g_{ij}\,. \tag{3}$$

The existence of isometric immersions (resp. embeddings) of Riemannian manifolds into some Euclidean space is a classical problem, explicitly formulated for the first time by Schläfli, see [44]: in the latter Schläfli conjectured that the system is solvable *locally* if the dimension N of the target is at least $s_n := \frac{n(n+1)}{2}$. Such conjecture stands to reason because (3) consists precisely of s_n equations in N unknowns. In the first half of the twentieth century Janet [34], Cartan [14] and Burstin [13] proved Schläfli's conjecture for analytic metrics.

For the very particular case of 2-dimensional spheres endowed with metrics of positive Gauss curvature, Weyl in [49] raised the question of the existence of (global!) isometric embeddings in $\mathbb{R}^3$. The Weyl's problem was solved by Lewy in [37] for analytic metrics and Nirenberg settled the case of smooth metrics in his PhD thesis in 1949; a different proof was given independently by Pogorelov [41] around the same time, building upon the work of Alexandrov [1] (see also [42]). Moreover in the case of the Weyl's problem it was proved by Herglotz and Cohn-Vossen, already before the work of Lewy, that C^2 immersions are uniquely determined up to rigid motions, cf. [16, 31] and see also [47] for a thorough discussion.

In his 1954 note [39] Nash astonished the geometry world and proved that the only true obstructions to the existence of isometric immersions are topological. As soon as $N \geq n+1$ and there are no such obstructions, then there are in fact plenty of such immersions, even though the system (3) looks heavily overdetermined. To be more precise we need some notation.

Definition 1. *Let (Σ, g) be a Riemannian manifold. An immersion $v : \Sigma \to \mathbb{R}^N$ is short if we have it "shrinks" the length of curves. For C^1 immersions*

[1] Here and in the rest of this note we follow Einstein's summation convention.

and in local coordinates such condition is equivalent to the inequality $(\partial_i u \cdot \partial_j u) w^i w^j \leq g_{ij} w^i w^j$ *for any tangent vector* w.

Theorem 2. *Let* (Σ, g) *be a smooth closed* n*-dimensional Riemannian manifold and* $v : \Sigma \to \mathbb{R}^N$ *a* C^∞ *short immersion with* $N \geq n+1$*. Then, for any* $\varepsilon > 0$ *there exists a* C^1 *isometric immersion* $u : \Sigma \to \mathbb{R}^N$ *such that* $\|u - v\|_{C^0} \leq \varepsilon$*. If* v *is, in addition, an embedding, then* u *can be assumed to be an embedding as well.*

Indeed Nash gave a proof of Theorem 2 for $N \geq n+2$ and just remarked that it could be proved for $N \geq n+1$ with some additional work; the details were then given in two subsequent notes by Kuiper, [36]. For this reason Theorem 2 is called nowadays the Nash–Kuiper Theorem on C^1 isometric embeddings.

Isometries of Riemannian manifolds behave then in rather different ways depending on their smoothness: from the one hand the rigidity of C^2 isometries, witnessed in the classical result of Cohn-Vossen and Herglotz, and on the other hand the flexibility of C^1 isometries stated in the Nash–Kuiper Theorem. A natural question is whether there is a threshold regularity which distinguishes between the two behaviors. The Hölder spaces give a classical way to measure intermediate smoothness between C^1 and C^2: a C^1 map v belongs to the Hölder space $C^{1,\alpha}$ (with $0 < \alpha < 1$) if

$$|Dv(x) - Dv(y)| \leq C|x - y|^\alpha$$

for some constant C independent of $x, y \in \Sigma$.

It is thus natural to look at $C^{1,\alpha}$ isometries of Riemannian manifolds and ask whether there is an α_0 such that such isometries display flexibility phenomena à la Nash–Kuiper for $\alpha < \alpha_0$ and rigidity phenomena à la Cohn-Vossen–Herglotz for $\alpha > \alpha_0$. The first mathematician to tackle such problem is Borisov, who published a series of works on the topic in the late fifties (see below). Later such question is mentioned by Gromov in [29] and Yau in [50] and in the recent work [30] Gromov advanced the conjecture that the threshold α_0 is in fact $\frac{1}{2}$.

Around 10 years ago Làszlò Székelyhidi and I pointed out a striking analogy between such problem and a well-known conjecture in the theory of mathematical fluid dynamics, proposed in 1949 by Lars Onsager, a celebrated norwegian theoretical physicist (we refer to the survey articles [24] and [27] for a throrough discussion of this and several other points mentioned below). The unveiling of such analogy was a consequence of our work [22]: in that paper we applied methods which are reminiscent of those used by Nash in [39] in order to explain the existence of weak solutions to the incompressible Euler equations which do not preserve the total kinetic energy.

The incompressible Euler equations describe the motion of a perfect incompressible fluid. Written down by L. Euler over 250 years ago, these are the continuum equations corresponding to the conservation of momentum and mass of arbitrary fluid regions. In Eulerian variables they can be written

as

$$\begin{cases} \partial_t v + (v \cdot \nabla) v + \nabla p = 0 \\ \\ \operatorname{div} v = 0, \end{cases} \tag{4}$$

where $v = v(x,t)$ is the velocity and $p = p(x,t)$ is the pressure. We will focus on the 3-dimensional case with periodic boundary conditions. In other words we take the spatial domain to be the flat 3-dimensional torus $\mathbb{T}^3 = \mathbb{R}^3/(2\pi\mathbb{Z})^3$. A classical solution on a given time interval $[0,T]$ is defined to be a pair $(v,p) \in C^1(\mathbb{T}^3 \times [0,T])$ which solves (4) pointwise.

As far as weak solutions are concerned, there are several notions (see for instance the survey article [24] and the lecture notes [48]). One commonly considered in the literature consists of pairs $(v,p) : \mathbb{T}^3 \times [0,1] \to \mathbb{R}^3 \times \mathbb{R}$ which solve (4) in the sense of distributions[2].

For classical solutions (i.e. if $v \in C^1$) the total energy

$$E(t) := \frac{1}{2} \int_{\mathbb{T}^3} |v(x,t)|^2 \, dx$$

is conserved by the flow induced by (4), so that $E(t) = E(0)$. Onsager in [40] was the first to suggest the existence of weak solutions which might dissipate the energy. Based on calculations in Fourier space, he formulated the following conjecture (in fact he had a non-rigorous proof of part (a)).

Conjecture 3. *Consider periodic 3-dimensional weak solutions of* (4)*, where the velocity v satisfies the uniform Hölder condition*

$$|v(x,t) - v(x',t)| \leq C|x - x'|^\theta, \tag{5}$$

for constants C and θ independent of x, x' and t.

(a) If $\theta > \frac{1}{3}$, then the total kinetic energy of v is constant;

(b) For any $\theta < \frac{1}{3}$ there are v for which the energy is not *constant.*

As already mentioned Onsager in [40] actually suggsted the existence of solutions for which the energy is strictly decreasing.

The "positive part" of the Conjecture, namely statement (a), has been proved by Constantin, E and Titi in [17] (a previous work of Eyink, [28], reached the critical threshold $\frac{1}{3}$ in a different scale of spaces). Concerning part (b), the first construction ever of an L^2 solution that violates the energy conservation is due to Scheffer in [43]. A different argument was later given by Shnirelman in [45], who was also able, a few years later, to give the first construction of a solution which dissipates the energy, cf. [46]. In [22] we gave a rather simple proof of these results, constructing bounded weak solutions of the incompressible Euler equations which violate the usual conservation energy and the uniqueness of the Cauchy problem in several ways (see also [23]). The key was to regard solutions of the system (4) as divergence-free matrix field satisfying a suitable algebraic constraint: in particular we realized that this point of view allowed to use well established techniques from the theory of differential inclusions, cf. [15, 8, 19, 38, 35].

[2]Recall the classical computation that $(v \cdot \nabla)v = \operatorname{div}(v \otimes v)$ if $\operatorname{div} v = 0$, so that distributional solutions are defined for any $v \in L^2(\mathbb{T}^3 \times [0,1])$.

In the latter field, the authors consider systems of partial differential equations which prescribe the values of the gradients of the solutions. Clearly the system (3) is a differential inclusion. Moreover a couple of decades ago the groundbreaking paper [38] established a fruitful connection between the techniques used in the theory of differential inclusions and Gromov's h-principle (more precisely his convex integration methods) of which the Nash–Kuiper theorem is a primary example, cf. [29].

Our intuition that a suitable approach à la Nash could provide a line of attack for part (b) of the Conjecture was confirmed by the following result, which we proved in [25], using a suitable "convex integration scheme".

Theorem 4. *Given any positive smooth function e on $[0,T]$ there is a pair $(v,p) : \mathbb{T}^3 \times [0,T] \to \mathbb{R}^3 \times \mathbb{R}$ of continuous functions which solves (4) in the distributional sense and satisfies $\frac{1}{2}\int_{\mathbb{T}^3} |v|^2(x,t)\,dx = e(t)$.*

At the same time we had turned our attention to the works of Borisov on the $C^{1,\alpha}$ isometric embeddings. In a series of papers in the 1950s, cf. [2, 3, 4, 5], he showed that the rigidity of the Weyl problem can in fact be extended to $C^{1,\theta}$ immersions provided θ is sufficiently large.

Theorem 5. *Let $(\mathbb{S}^2, g)$ be a surface with C^2 metric and positive Gauss curvature, and let $u \in C^{1,\theta}(\mathbb{S}^2;\mathbb{R}^3)$ be an isometric immersion with $\theta > 2/3$. Then $u(\mathbb{S}^2)$ is the boundary of an open convex set.*

Borisov's Theorem is more general, but the statement above avoids the introduction of Pogorelov's concept of bounded extrinsic curvature, cf. [18]: Borisov proves such property without any assumption on the topology of the surface and then exploits the work of Pogorelov, [42], to conclude the local convexity of the image. In [18] we discovered a very short proof of Borisov's Theorem, which exploits the same key computation of Constantin-E-Titi's proof of part (a) of Onsager's conjecture: another remarkable analogy between the Borisov–Gromov Problem and the Onsager Conjecture!

For sufficiently small Hölder exponents, instead, the Nash-Kuiper construction remains valid:

Theorem 6. *Let (Σ, g) be a C^2 Riemannian manifold of dimension n. Any short immersion $u : \Sigma \to \mathbb{R}^{n+1}$ can be uniformly approximated with $C^{1,\theta}$ isometric immersions with*

(a) $\theta < \frac{1}{1+n(n+1)}$ *when Σ is a closed ball;*
(b) $\theta < \frac{1}{1+n(n+1)^2}$ *when Σ is a general compact n-manifold;*
(c) $\theta < \frac{1}{5}$ *if Σ is a 2-dimensional disk.*

The maps can be chosen to be embeddings if u is an embedding.

Case (a) of this theorem was announced in [6] by Borisov, based on his habilitation thesis, under the additional assumption that g be analytic. A proof with $n = 2$ appeared more than 40 years later, cf. [7]. The general statements (a) and (b) of Theorem 6 have been proved in [18], whereas the improved bound for 2-dimensional disks, namely statement (c), has been shown rather recently in [21].

Coming back to part (b) of the Onsager conjecture the last five years witnessed a series of results, starting from [25], until the full conjecture with

threshold exponent 1/3 was finally solved last year. Having fixed a certain specific space of (at least L^2) functions X, the results in the literature can be classified in the following two categories:

(A) There exists a nontrivial weak solution $v \in X$ of (4) with compact support in time.

(B) Given any smooth positive function $E = E(t) > 0$, there exists a weak solution $v \in X$ of (4) with

$$\frac{1}{2}\int |v(x,t)|^2\,dx = E(t) \quad \forall\, t. \tag{6}$$

Obviously both types lead to non-conservation of energy and part (b) of Conjecture 3 corresponds to the space $X = L^\infty(0,1;C^{1/3-\varepsilon}(\mathbb{T}^3))$. However a (B)-type statement is somewhat closer to what Onsager discusses in his 1949 work, since it implies the existence of dissipative solutions.

Statement (B) has been shown for $X = L^\infty(0,1;C^{1/10-\varepsilon})$ in [26], whereas Isett in his PhD thesis [32] was the first to prove Statement (A) for $X = L^\infty(0,1;C^{1/5-\varepsilon})$. Subsequently, in a joint work with Buckmaster and Isett we proved Statement (B) for $X = L^\infty(0,1;C^{1/5-\varepsilon})$ in [12]. The Onsager critical exponent $\frac{1}{3}$ was then reached in [9] jointly with Buckmaster, but in a weaker space: in the latter reference we could prove statement (A) $X = L^1(0,1;C^{1/3-\varepsilon}(\mathbb{T}^3))$, based on a clever modification of the scheme proposed by Buckmaster in [11].

The final resolution of Conjecture 3 is due to two important new ideas: the first one has been introduced by Daneri and Székelyhidi in [20], who used it to show a rather general h-principle statement without however improving the regularity of the solutions known at the time. In his recent groundbreaking work [33] Isett combined the idea of [20] with a new fundamental ingredient to finally show statement (A) in the space $C^{1/3-\varepsilon}(\mathbb{T}^3 \times [0,T])$, thus proving part (b) of Conjecture 3. Slightly later, in a joint work with Buckmaster and Vicol, we could improve Isett's arguments to reach statement (B) (and hence prove the existence of dissipative solutions) in the same statement, cf. [10].

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1.5. Nachrufe

Reinhold Remmert (1930-2016)

Die Gesellschaft für Mathematische Forschung (GMF) und das Mathematische Forschungsinstitut Oberwolfach trauern um Reinhold Remmert, der am 9. März 2016 verstarb.

Reinhold Remmert wurde am 22. Juni 1930 in Osnabrück, in Niedersachsen geboren. Er studierte Mathematik, mathematische Logik und Physik an der Universität Münster und promovierte dort bei Heinrich Behnke. Nach seiner Habilitation im Jahr 1957 hatte er zunächst Lehrstühle in Erlangen (1960) und Göttingen (1963) inne. Anschließend war er bis zu seinem Ruhestand im Jahr 1995 Professor für Komplexe Analysis in Münster. Er nahm Gastprofessuren am IAS in Princeton und am IHES in Paris wahr und war Mitglied der Bayerischen, der Nordrhein-Westfälischen und der Österreichischen Akademie der Wissenschaften. 1990 erhielt er die Ehrendoktorwürde der Universität Bochum.

Er war einer der führenden deutschen Mathematiker auf dem Gebiet der Funktionentheorie. Gemeinsam mit Hans Grauert und Karl Stein begründete und entwickelte er die Theorie komplexer Räume. Seine Monografien zu diesen Themen belegen sein tiefgehendes historisches Interesse.

1.5. Obituaries

Reinhold Remmert (1930-2016)

The Society of Mathematical Research (GMF) and the Mathematisches Forschungsinstitut Oberwolfach mourn the death of Reinhold Remmert, who passed away on 09 March 2016.

Reinhold Remmert was born 22nd of June 1930 in Osnabrück, Lower Saxony. He studied mathematics, mathematical logic and physics in Münster, where he got his PhD with Heinrich Behnke. After his habilitation 1957 in Münster he was professor in Erlangen (1960), Göttingen (1963) and until his retirement in 1995 professor for complex analysis in Münster. He held visiting professorships at the IAS, Princeton and the IHES, Paris and was member of the Bavarian, North Rhine-Westphalian as well as the Austrian Academy of Sciences and in 1990 got an honorary doctorate of the University of Bochum.

He was one of the leading German mathematicians in function theory, where he established and developed the theory of complex-analytic spaces in joint work with Hans Grauert and Karl Stein. His monographs on these subjects also show a profound historical interest.

Seit 1977 war er Mitglied der Wissenschaftlichen Kommission und der Gesellschaft für Mathematische Forschung (GMF), den leitenden Organen des Mathematischen Forschungsinstituts Oberwolfach.

Since 1977 he was a member of the Scientific Committee and the Society of Mathematical Research (GMF), the governing bodies of the Mathematisches Forschungsinstitut Oberwolfach.

1992 gründete er den Förderverein „Friends of Oberwolfach" mit dem Ziel das Institut, das sich damals in einer schwierigen finanziellen Lage befand, zu unterstützen und ihm die Flexibilität zu geben, die wissenschaftlichen Programme trotz der Budgetbeschränkungen fortzusetzen. Dies war ein bedeutender Schritt. Zwar war er in finanzieller Hinsicht weniger entscheidend, doch er alarmierte die gesamte deutsche und internationale mathematische Gemeinschaft darüber, dass eines ihrer wichtigsten Zentren für den wissenschaftlichen Austausch Unterstützung brauchte.

In 1992 Reinhold Remmert founded the association of "Friends of Oberwolfach" to support the Institute, which happened to be in a critical state of funding, providing it with some financial flexibility to continue the programs of Oberwolfach under the budget constraints at that time. This was an important step not solely financially, but to alert the mathematical community in Germany and internationally that one of their top meeting facilities for scientific exchange needed support.

Er stand dem Verein bis zum Jahr 2007 insgesamt 15 Jahre lang vor. In dieser Zeit bemühte er sich mit seinen Vereinskollegen darum, eine weitere finanzielle Basis für das Institut ins Leben zu rufen: Die Oberwolfach Stiftung. Ihr Ziel war es, für eine langjährige zusätzliche Unterstützung Stiftungskapital von deutschen Unternehmen zu gewinnen, die ein lebhaftes Interesse an der Förderung mathematischer Forschung hatten. Der Vorstand der Stiftung, bestehend aus namhaften Vertretern der deutschen Industrie, ist ein Beleg dafür wie erfolgreich diese Initiative war. Ein Nebeneffekt der Stiftung war, dass Vertreter des deutschen Wissenschaftsministeriums stärker auf die Schlüsselrolle aufmerksam wurden, die Oberwolfach im internationalen Austausch mathematischer Forschung einnahm. Dies stellte sich für Oberwolfach als sehr wichtig heraus. Indem die Stiftung Treffen zwischen Führenden der Industrie und Politikern initierte, half sie Oberwolfach dabei, als erfolgreiches Leibniz-Institut in ein stabiles, durch Bund und Länder finanziertes Förderprogramm aufgenommen zu werden.

He chaired this association for fifteen years until 2007. At the same time he initiated together with his colleagues another base of financial support for the institute: the "Oberwolfach Foundation". Its aim is to collect endowment funds for long-term additional support from German companies and individuals with a vivid interest in supporting mathematical research. The projects of this foundation, represented by well-known representatives of German industry on its board, show that this initiative has been very successful. A side effect of this foundation, an increase in the awareness of the German science administration to the role of Oberwolfach as a key player in international exchange in Mathematical Research, turned out to be very important for Oberwolfach. By initiating meetings of industrial leaders and politicians about the role of mathematics, Reinhold Remmert and the Foundation helped the Institute to enter a stable funding scheme as a successful Leibniz Institute which is financed by the Federal Government and the German states.

Aufbauend auf dem Angebot von Peter Preuss, jede Spende an den Horst Tietz Fund, den zuerst gegründeten Fonds der Stiftung, zu verdoppeln, reicht das derzeitige Stiftungsvermögen aus, um das Institut jährlich mit einem Betrag von 25.000 Euro in verschiedenen Projekten zu unterstützen. Um nur einige Beispiele zu nennen: Bereitstellung des Startkapitals für Oberwolfach zur Gründung einer gemeinnützigen GmbH (notwendige Vorraussetzung, um ein Leibniz-Institut zu werden), Finanzierung befristeter IT-Mitarbeiter, Kauf von Land für die von der VolkswagenStiftung finanzierten neuen Räumlichkeiten der Bibliothekserweiterung sowie Sponsoring des Oberwolfach Preises für Nachwuchswissenschaftler.

Starting with an offer of Peter Preuss to match any contribution to the Horst Tietz fund he had founded as initial endowment for the Foundation, Reinhold Remmert was instrumental in accumulating assets that allow significant annual support for various projects of the Institute. To mention just a few examples: supplying the start capital of Oberwolfach as a non profit company (necessary for becoming a Leibniz Institute), covering temporary IT staff, buying land for the premises of the library extension that was financed by the Volkswagen Foundation and the Klaus Tschira Stiftung, as well as sponsoring the Oberwolfach Prize for young scientists.

Das Institut und die GMF sind sehr dankbar für das langjährige Engagement von Reinhold Remmert. Es hat dazu beigetragen, Oberwolfach bis zu seiner derzeitigen hervorragenden Position als international führender Ort für mathematische Forschung und Austausch voranzubringen.

Friedrich Götze
Vorstand der GMF

The Institute and the GMF are very much indebted to this long lasting commitment of Reinhold Remmert which helped to advance Oberwolfach to its current excellent position as an internationally leading place for mathematical research and exchange.

Friedrich Götze
Chair of the GMF

Jean-Christophe Yoccoz (1957-2016)

Jean-Christophe Yoccoz (1957-2016)

Jean-Christophe Yoccoz starb am 3. September 2016 nach langer Krankheit im Alter von 59 Jahren. Seit dem Jahr 2009 war er Mitglied der Wissenschaftlichen Kommission von Oberwolfach.

Jean-Christophe Yoccoz hatte eine erstaunliche Karriere: Ein Jahr nachdem er eine Goldmedaille bei der Internationalen Mathematik-Olympiade gewonnen hatte, wurde er 1975 im Alter von achtzehn Jahren als Erstplatzierter zum Studium an der École Normale Supérieure zugelassen. 1985 promovierte er bei Michael Herman an der École Polytechnique. Nach einem frühen Einstieg am CNRS im Jahr 1979 und seinem

On September 3rd of 2016, Jean-Christophe Yoccoz passed away after a long illness at the age of 59. He was member of Oberwolfach's Scientific Committee since the year of 2009.

Jean-Christophe Yoccoz had a stunning career: A year after receiving a gold medal in the Mathematical Olympics, he was admitted as first-ranked to the École Normale Supérieure in 1975 at the age of eighteen. He received his PhD in 1985 under the direction of Michael Herman at the École Polytechnique. After an early start with the CNRS in 1979, and a military service at IMPA, he was appointed professor at Orsay

Militärdienst bei der IMPA erhielt er 1988 einen Lehrstuhl in Orsay und wurde 1996 zum Professor am Collège de France ernannt, wo er seine erste Lehrveranstaltung über „einige Beispiele für schwach hyperbolische Dynamik" hielt.

1994 erhielt Jean-Christophe Yoccoz auf der ICM in Zürich die Fields Medaille für seine Forschung auf dem Gebiet dynamischer Systeme. Seine beiden ICM-Präsentationen hielt er zu den Themen „Jüngste Entwicklungen in der Dynamik" (1994) und „Optimale arithmetische Bedingungen für das Problem der kleinen Nenner" (1990).

Jean-Christophe Yoccoz hatte einen starken Einfluss auf Oberwolfach: Achtmal gehörte er zu den Organisatoren der Flaggschiff-Workshop-Serie zu dynamischen Systemen. Das erste Mal nahm er 1995 teil und sprach über Schnittmengen regulärer Cantor-Mengen. Sieben Jahre lang hat er das Institut als geschätztes Mitglied der Wissenschaftlichen Kommission ehrenamtlich unterstützt. Wir werden ihn in anerkennender Erinnerung behalten.

Felix Otto
Vorsitzender der Wissenschaftlichen Kommission

in 1988, and was nominated professor at the Collège de France in 1996, where his first course was on "some examples of weakly hyperbolic dynamics".

In 1994, Jean-Christophe Yoccoz was awarded the Fields Medal for his work on dynamical systems at the ICM in Zürich. His two ICM presentations were entitled "Recent Developments in Dynamics" (1994) and "Optimal arithmetic conditions on the small divisor problem" (1990).

Jean-Christophe Yoccoz had a strong influence on Oberwolfach: Eight times he was among the organizers of the flagship workshop series on dynamical systems. His first participation in that workshop series was in the summer of 1995, where he spoke on the intersection of regular Cantor sets. For seven years he had voluntarily supported the Institute as a valued member of the Scientific Committee. We will remember him with great appreciation.

Felix Otto
Chair of the Scientific Committee

2. Wissenschaftliches Programm

Das wissenschaftliche Programm wird vom Direktor in Zusammenarbeit mit der Wissenschaftlichen Kommission der Gesellschaft für Mathematische Forschung e.V. entschieden. Dieses Gremium basiert auf der ehrenamtlichen Arbeit von ca. 20-25 hochkarätigen Mathematikerinnen und Mathematikern, die die gesamte Breite der Mathematik vertreten. Die Wissenschaftliche Kommission begutachtet alle wissenschaftlichen Veranstaltungen des Instituts vor ihrer Genehmigung. Das Programm wird in einem wettbewerblichen Verfahren nach streng wissenschaftlichen Kriterien gestaltet. Wie in den Vorjahren erhielt das MFO wesentlich mehr Anträge als genehmigt werden konnten.

2.1. Übersicht der Programme

Das Mathematische Forschungsinstitut Oberwolfach hat sechs zentrale Programme: das Workshop-Programm, das Miniworkshop-Programm, die Oberwolfach Arbeitsgemeinschaft, die Oberwolfach Seminare, das Research in Pairs Programm und die Oberwolfach Leibniz Fellows. Im Rahmen dieser Programme existieren zusätzlich spezielle Fördermöglichkeiten für Nachwuchswissenschaftler und etablierte Forscher.

Das Workshop Programm

Das wissenschaftliche Hauptprogramm besteht aus etwa 40 einwöchigen Workshops pro Jahr mit jeweils etwa 50 Teilnehmenden. Alternativ können zwei Workshops halber Größe parallel stattfinden. Die Workshops werden von international führenden Expertinnen und Experten der jeweiligen Fachgebiete organisiert. Die Teilnehmer werden auf Empfehlung der Organisatoren vom Direktor persönlich eingeladen.

Simons Visiting Professors

Das Simons Visiting Professors (SVP) Programm wird durch die Simons Foundation finanziert. Das Programm unterstützt jährlich bis zu 40 Simons Visiting Professors, führende Wissenschaftlerinnen und Wissenschaftler von außerhalb Europas, die eine Einladung zu einem Oberwolfacher Workshop mit einem Forschungsaufenthalt an einer europäischen Universität von bis zu zwei Wochen kombinieren möchten. Das Programm bietet Unterstützung in Höhe von 135 Euro pro Tag des Gastaufenthalts an der Universität. Die beteiligten Universitäten stellen Unterkünfte für die Dauer des Besuches an der Universität zur Verfügung und tragen die Reisekosten innerhalb Europas zwischen Oberwolfach und der Universität. Die SVP Auszeichnungen werden vom Direktor auf Vorschlag der Organisatoren eines Workshops entschieden.

2. Scientific program

The Director of the Institute decides on the scientific program in cooperation with the Scientific Committee of the Gesellschaft für Mathematische Forschung e.V. The Comittee is based on the honorary work of about 20 to 25 top-class mathematicians, covering all areas of mathematics. The Scientific Committee examines all scientific events at the Institute prior to their approval. The program is fixed in a competitive procedure according to strictly scientific criteria. As in the preceding years, the MFO received many more proposals than could be approved.

2.1. Overview on the program

The Mathematisches Forschungsinstitut Oberwolfach focuses on six central programs: the Workshop program, the Mini-Workshop program, the Oberwolfach Arbeitsgemeinschaft, the Oberwolfach Seminars, the Research in Pairs program, and the Oberwolfach Leibniz Fellows. Within these programs, there are also special funding opportunities for junior and established researchers.

The Workshop program

The main scientific program consists of about 40 week-long Workshops per year, each with about 50 participants. Alternatively, there can be two parallel Workshops of half size (about 25 participants). The Workshops are organized by internationally leading experts in the relevant fields. The participants are personally invited by the Director after recommendation by the organizers.

Simons Visiting Professors

The Simons Visiting Professors (SVP) program is funded by the Simons Foundation. The program annually supports up to 40 Simons Visiting Professors, distinguished scientists from outside Europe, who wish to combine an invitation to an Oberwolfach Workshop with a research visit to a European university of up to two weeks. The program provides support to each Simons Visiting Professor by Oberwolfach amounting to 135 Euro per day of the university visit. Additionally, the participating universities are required to provide accommodation for the duration of the visit at the university as well as travel expenses within Europe between Oberwolfach and the university as a matching of this support. The SVP awards are decided by the director on suggestion of the organizers of a workshop.

Das Miniworkshop Programm

Im Rahmen dieses Programms können jährlich 12 einwöchige Miniworkshops mit jeweils etwa 15 Teilnehmenden veranstaltet werden. Die Miniworkshops wenden sich besonders an Nachwuchsforscherinnen und -forscher. Da über die Themen erst ein halbes Jahr im Voraus entschieden wird, ist es möglich, auf aktuelle Entwicklungen schnell zu reagieren.

Die Oberwolfach Arbeitsgemeinschaft

Die Idee der Arbeitsgemeinschaft ist es, sich unter Anleitung international anerkannter Spezialisten durch eigene Vorträge in ein neues, aktuelles Gebiet einzuarbeiten. Die Arbeitsgemeinschaft findet zweimal jährlich für jeweils eine Woche statt und wird von Prof. Dr. Christopher Deninger und Prof. Dr. Gerd Faltings organisiert. Sie richtet sich sowohl an Nachwuchswissenschaftler als auch an etablierte Forscher.

Die Oberwolfach Seminare

Die Oberwolfach Seminare sind einwöchige Veranstaltungen, die sechsmal im Jahr stattfinden. Sie werden von führenden Experten der jeweiligen Fachgebiete organisiert und wenden sich an Promovierende und Postdoktoranden aus aller Welt. Das Ziel ist es, 25 Teilnehmer in ein besonders aktuelles Arbeitsgebiet einzuführen.

Wir freuen uns, dass die Carl Friedrich von Siemens Stiftung die Oberwolfach Seminare von Sommer 2008 bis Ende 2019 substanziell unterstützt.

Das Research in Pairs Programm

Ein weiterer Schwerpunkt ist das Programm „Research in Pairs" (RiP). Dieses Programm ermöglicht es jeweils 2 bis 4 Forscherinnen und Forschern aus verschiedenen Institutionen am MFO gemeinsam an einem vorher festzulegenden Projekt zu arbeiten. Ein Aufenthalt dauert zwischen 2 Wochen und 3 Monaten.

Oberwolfach Leibniz Fellows

In diesem Postdoktoranden-Programm werden besonders qualifizierte Nachwuchswissenschaftler in einer entscheidenden Phase ihrer wissenschaftlichen Laufbahn durch die Bereitstellung idealer Arbeitsbedingungen in einem internationalen Umfeld gefördert. Die jungen Forschenden können sich allein oder in Kleingruppen für die Durchführung eines Forschungsprojekts in Oberwolfach von zwei bis zu sechs Monaten bewerben. Entscheidend ist die Einbindung der Oberwolfach Leibniz Fellows in eine aktive Arbeitsgruppe mit einem etablierten Wissenschaftler einer Universität oder einer Forschungseinrichtung.

The Mini-Workshop program

This program offers 12 week-long Mini-Workshops per year, each with about 15 participants. These Mini-Workshops are aimed especially at junior researchers. Since the subjects are fixed only half a year before the Mini-Workshops take place, they allow to react to recent developments.

The Oberwolfach Arbeitsgemeinschaft

The idea of the Arbeitsgemeinschaft (study group) is to learn about a new active topic by giving a lecture on it, guided by leading international specialists. The Arbeitsgemeinschaft meets twice per year for one week each time and is organized by Prof. Dr. Christopher Deninger and Prof. Dr. Gerd Faltings. It is aimed both at senior and junior researchers.

The Oberwolfach Seminars

The Oberwolfach Seminars are week-long events taking place six times per year. They are organized by leading experts in the field and address postdocs and Ph.D. students from all over the world. They aim at introducing 25 participants to a particularly hot development.

We are pleased that the Carl Friedrich von Siemens Foundation substiantially supports the Oberwolfach Seminars from summer 2008 to 2019.

The Research in Pairs program

A further main activity of the Institute is the "Research in Pairs" (RiP) program. This program is aimed at small groups of 2-4 researchers from different places working together at the Mathematisches Forschungsinstitut Oberwolfach for 2 weeks up to 3 months on a specific project.

Oberwolfach Leibniz Fellows

The focus of this postdoctoral program is to support excellent junior researchers in an important period of their scientific career by providing ideal working conditions in an international atmosphere. Outstanding junior researchers can apply to carry out a research project, individually or in small groups, for a period from two to six months. Oberwolfach Leibniz Fellows should be involved in an active research group with an established senior researcher at a university or another research institute. This is part of a cooperation with the European Post-Doctoral Institute (EPDI) in which well-known mathematical

Es besteht eine Kooperation mit dem europäischen Postdoktorandennetzwerk EPDI, an dem bekannte mathematische Institute teilnehmen (IHES, Newton-Institut, Max-Planck-Institute in Bonn und Leipzig, Mittag-Leffler-Institut, Erwin Schrödinger Institut in Wien, Banach Center in Warschau, Centre de Recerca Matematica in Barcelona, Forschungsinstitut der ETH Zürich).

Oberwolfach Leibniz Graduate Students

Seit Beginn des Jahres 2009 unterstützt das MFO die Teilnahme von im Durchschnitt fünf Doktoranden an den Oberwolfach Workshops. Gefördert werden exzellente Doktoranden oder frisch Promovierte bis zu zwei Jahre nach der Promotion, insbesondere durch Reisekostenunterstützung. Es handelt sich um fünf zusätzliche Plätze pro Workshop, die für die Oberwolfach Leibniz Graduate Students reserviert sind und nicht durch etablierte Forscher besetzt werden dürfen.

US Junior Oberwolfach Fellows

Das MFO fördert die Teilnahme von herausragenden Nachwuchsforschern US-amerikanischer Universitäten in allen einwöchigen Programmen des Instituts. Diese Förderung ist möglich dank der Unterstützung der amerikanischen National Science Foundation (NSF).

Publikationen

Das MFO veröffentlicht insgesamt vier Publikationsreihen und unterstützt dabei die Idee von Open Access. Mit Ausnahme der Buchreihe „Oberwolfach Seminars" sind alle Veröffentlichungen elektronisch frei verfügbar.

Um die Ergebnisse der Workshops einem international weiten Kreis zugänglich zu machen wurde 2004 die Buchserie „Oberwolfach Reports" (OWR) in Zusammenarbeit mit dem Publishing House der European Mathematical Society gegründet. Sie erscheint jährlich mit 4 Ausgaben von insgesamt mehr als 3.000 Seiten in einer Auflage von 300 Stück. Die OWR beinhalten erweiterte Kurzfassungen aller Vorträge der Workshops, Miniworkshops und Arbeitsgemeinschaften im Umfang von jeweils ein bis drei Seiten.

„Oberwolfach Seminars" (OWS) ist eine Buchreihe in Zusammenarbeit mit dem Birkhäuser Verlag (Basel), die den Inhalt der Oberwolfach Seminare für Doktoranden, Postdoktoranden und interessierte Forscher zugänglich macht.

In den „Oberwolfach Preprints" (OWP) werden hauptsächlich Resultate von längerfristigen Forschungsaufenthalten (RiP und OWLF) publiziert.

institutes are already participating (IHES, Newton-Institute, Max-Planck-Institute in Bonn and Leipzig, Mittag-Leffler-Institute, Erwin Schrödinger Institute in Vienna, Banach Center in Warsaw, Centre de Recerca Matematica in Barcelona, Research Institute of ETH Zürich).

Oberwolfach Leibniz Graduate Students

Since the beginning of 2009, the MFO has been supporting the participation of an average of five doctoral students per Oberwolfach Workshop. This program fosters excellent graduate students and recent post docs (the Ph.D./Dr. degree must be received not more than two years ago), in particular by the reimbursement of travel costs. For this program, each Oberwolfach Workshop is given an extra capacity of five places which may not be taken by senior researchers.

US Junior Oberwolfach Fellows

The MFO supports the participation of outstanding junior researchers from US universities in all weekly programs of the Institute. This is possible thanks to the support of the National Science Foundation (NSF).

Publications

The MFO has four distinct publication series and supports the idea of open access. Hence, all publications are freely available, with the exception of the book series Oberwolfach Seminars from Birkhäuser.

The Oberwolfach Reports (OWR) were initiated in 2004 in collaboration with the Publishing House of the European Mathematical Society. They appear quarterly in an edition of 300 copies. The 4 issues comprise more than 3,000 pages per year. The OWR are comprised of official reports of every workshop, containing extended abstracts of the given talks during Workshops, Mini-Workshops and Arbeitsgemeinschaften (study groups), of one up to three pages per talk.

"Oberwolfach Seminars" (OWS) is a book series in collaboration with Birkhäuser. In this series, the material of the Oberwolfach Seminars for junior researchers is made available to an even larger audience.

The "Oberwolfach Preprints" (OWP) mainly contain research results related to a longer stay in Oberwolfach (RiP and OWLF).

Die „Schnappschüsse moderner Mathematik aus Oberwolfach" richten sich an die mathematisch interessierte Öffentlichkeit und erklären mathematische Ideen und Probleme in verständlicher Art und Weise. Sie werden von Teilnehmenden des wissenschaftlichen Programms am MFO geschrieben. Ein Team aus Editorinnen und Editoren unterstützt sie bei der Aufbereitung der komplizierten Sachverhalte für ein breites Publikum. Das MFO veröffentlicht die Schnappschüsse frei verfügbar unter einer Creative Commons Lizenz auf www.mfo.de/snapshots und www.imaginary.org/snapshots. Das Projekt wurde bis Mitte 2016 maßgeblich von der Klaus Tschira Stiftung finanziert.

The "snapshots of modern mathematics from Oberwolfach" address to everyone who is interested in mathematics and explain mathematical problems and ideas in an accessible and understandable way. They are written by participants of the scientific program at the MFO, who volunteer to explain an important aspect of their research. A team of editors assists them in communicating complicated matters to a broad audience. The MFO publishes the snapshots for free download under a Creative Commons license on www.mfo.de/snapshots and www.imaginary.org/snapshots. The project was financed by the Klaus Tschira Stiftung until summer 2016.

Preise

Der Oberwolfach Preis wird etwa alle drei Jahre von der Gesellschaft für Mathematische Forschung e.V. und der Oberwolfach Stiftung an europäische Nachwuchsforscher verliehen. Der Preis ist für ausgezeichnete Errungenschaften in jeweils wechselnden Gebieten der Mathematik ausgelobt. Das MFO verleiht ebenfalls etwa alle drei Jahre zusammen mit der Oberwolfach Stiftung den John Todd Award für Nachwuchsforscher auf dem Gebiet der numerischen Analysis. Der Oberwolfach Preis ist mit 10.000 Euro und der John Todd Award mit 1.000 Euro dotiert.

Prizes

The Oberwolfach Prize is awarded by the Gesellschaft für Mathematische Forschung e.V. and by the Oberwolfach Foundation to European junior researchers. The prize is awarded for excellent achievements in changing fields of mathematics. The Oberwolfach Foundation awards in cooperation with the MFO approximately every three years the John Todd Award to junior scientists in numerical analysis. The Oberwolfach Prize amounts to 10,000 Euro and the John Todd Award to 1,000 Euro.

Weitere Aktivitäten und Dienste

Das Institut beherbergte im Jahr 2016 erneut die abschließende Trainingswoche für besonders begabte Schülerinnen und Schüler zur Vorbereitung auf die Internationale Mathematik-Olympiade. Als Dienste für die Öffentlichkeit sind außerdem die Oberwolfach Fotosammlung, die Oberwolfach References for Mathematical Software (ORMS), das Museum für Mineralien und Mathematik und die Wanderausstellung IMAGINARY zu nennen.

Further activities and services

In 2016 the Institute again hosted the final training week for especially gifted pupils to prepare for the International Mathematical Olympiad. As further services provided for the general public the Oberwolfach Photo Collection, the Oberwolfach References for Mathematical Software (ORMS), the Museum for Minerals and Mathematics, and the travelling exhibition IMAGINARY are to be mentioned.

2.2. Jahresprogramm 2016

Im Jahr 2016 wurden während 43 Wochen 46 Workshops durchgeführt, 12 Miniworkshops während vier Wochen, 6 Oberwolfach Seminare während drei Wochen und 2 Arbeitsgemeinschaften während 2 Wochen. Insgesamt nahmen mehr als 2700 Forscherinnen und Forscher aus aller Welt an allen Programmen teil, davon ca. 26% aus Deutschland, 39% aus Resteuropa und 35% aus dem nichteuropäischen Ausland. Das Institut legt großen Wert darauf, dass alle Gebiete der Mathematik und ihre Grenzgebiete, auch im Hinblick auf Anwendungen, vertreten sind. Das folgende Tagungsprogramm belegt diese Politik.

2.2. Annual schedule 2016

In the year 2016 46 workshops have taken place during 43 weeks, as well as 12 Mini-Workshops during four weeks, 6 Oberwolfach Seminars during three weeks and 2 Arbeitsgemeinschaften during 2 weeks. In total, more than 2700 researchers from all over the world attended the Oberwolfach research program, about 26% from Germany, 39% from the rest of Europe, and 35% from non-European countries. The Institute emphasizes that all fields of mathematics and related areas are represented, including applications. The following scientific program gives proof of this policy.

Workshops

03.01. – 09.01.2016 **Model Theory: groups, geometry, and combinatorics**
Organizers: Katrin Tent, Münster
Frank Wagner, Villeurbanne
Martin Ziegler, Freiburg

10.01. – 16.01.2016 **Graph Theory**
Organizers: Reinhard Diestel, Hamburg
Daniel Kral, Warwick
Paul Seymour, Princeton

17.01. – 23.01.2016 **Lattices and Applications in Number Theory**
Organizers: Renaud Coulangeon, Talence
Benedict Gross, Cambridge MA
Gabriele Nebe, Aachen

24.01. – 30.01.2016 **Mathematical Imaging and Surface Processing**
Organizers: Antonin Chambolle, Palaiseau
Martin Rumpf, Bonn
Peter Schröder, Pasadena

31.01. – 06.02.2016 **Algebraic Cobordism and Projective Homogeneous Varieties**
Organizers: Stefan Gille, Edmonton
Marc Levine, Essen
Ivan Panin, St. Petersburg
Alexander Vishik, Nottingham

14.02. – 20.02.2016 **Topological Recursion and TQFTs**
Organizers: Gaetan Borot, Bonn
Leonid Chekhov, Moscow
Bertrand Eynard, Gif-sur-Yvette
Katrin Wendland, Freiburg

14.02. – 20.02.2016 **Hochschild Cohomology in Algebra, Geometry, and Topology**
Organizers: Luchezar L. Avramov, Lincoln
Ragnar-Olaf Buchweitz, Toronto
Wendy Lowen, Antwerpen

21.02. – 27.02.2016 **Asymptotic Geometric Analysis**
Organizers: Shiri Artstein-Avidan, Tel Aviv
Hermann König, Kiel
Alexander Koldobsky, Columbia

21.02. – 27.02.2016 **New Developments in Functional and Highly Multivariate Statistical Methodology**
Organizers: Gerda Claeskens, Leuven
Holger Dette, Bochum
Irène Gijbels, Leuven
Peter Hall, Parkville VIC

06.03. – 12.03.2016 **Computationally and Statistically Efficient Inference for Complex Large-scale Data**
Organizers: Gilles Blanchard, Potsdam
Nicolai Meinshausen, Zürich
Richard Samworth, Cambridge
Ming Yuan, Madison

13.03. – 19.03.2016 **Mechanics of Materials: Mechanics of Interfaces and Evolving Microstructure**
Organizers: Reinhold Kienzler, Bremen
David L. McDowell, Atlanta
Stefan Müller, Bonn
Ewald A. Werner, München

20.03. – 26.03.2016 **Geometric Numerical Integration**
Organizers: Erwan Faou, Bruz/Paris
Ernst Hairer, Genève
Marlis Hochbruck, Karlsruhe
Christian Lubich, Tübingen

27.03. – 02.04.2016 **Toric Geometry**
Organizers: Jürgen Hausen, Tübingen
Diane Maclagan, Coventry
Hal Schenck, Urbana

10.04. – 16.04.2016 **Diophantische Approximationen**
Organizers: Yann Bugeaud, Strasbourg
Philipp Habegger, Basel
Umberto Zannier, Pisa

17.04. – 23.04.2016 **Combinatorics and Probability**
Organizers: Bela Bollobás, Cambridge UK
Michael Krivelevich, Tel Aviv
Oliver Riordan, Oxford
Emo Welzl, Zürich

24.04. – 30.04.2016 **Moduli spaces and Modular forms**
Organizers: Jan Hendrik Bruinier, Darmstadt
Gerard van der Geer, Amsterdam
Valery Gritsenko, Villeneuve d'Ascq

01.05. – 07.05.2016 **Rough Paths, Regularity Structures and Related Topics**
Organizers: Thomas Cass, London
Peter Friz, Berlin
Massimilliano Gubinelli, Paris

08.05. – 14.05.2016 **Factorization Algebras and Functorial Field Theories**
Organizers: Owen Gwilliam, Bonn
Stephan Stolz, Notre Dame
Peter Teichner, Bonn
Mahmoud Zeinalian, New York

22.05. – 28.05.2016 **The Renormalization Group**
Organizers: Wojciech De Roeck, Leuven
Margherita Disertori, Bonn
Manfred Salmhofer, Heidelberg

29.05. – 04.06.2016 **Nonlinear Evolution Problems**
Organizers: Klaus Ecker, Berlin
Jalal Shatah, New York
Gigliola Staffilani, Cambridge MA
Michael Struwe, Zürich

05.06. – 11.06.2016 **Geometrie**
Organizers: John Lott, Berkeley
André Neves, London
Iskander Taimanov, Novosibirsk
Burkhard Wilking, Münster

12.06. – 18.06.2016 **Classical Algebraic Geometry**
Organizers: Olivier Debarre, Paris
David Eisenbud, Berkeley
Gavril Farkas, Berlin
Ravi Vakil, Stanford

19.06. – 25.06.2016 **Hyperbolic Techniques in Modelling, Analysis and Numerics**
Organizers: Rinaldo M. Colombo, Brescia
Philippe G. LeFloch, Paris
Christian Rohde, Stuttgart

26.06. – 02.07.2016 **Algebraic K-theory and Motivic Cohomology**
Organizers: Thomas Geisser, Tokyo
Annette Huber-Klawitter, Freiburg
Uwe Jannsen, Regensburg
Marc Levine, Essen

03.07. – 09.07.2016 **Statistics for Shape and Geometric Features**
Organizers: Dragi Anevski, Lund
Christopher Genovese, Pittsburgh
Geurt Jongbloed, Delft
Wolfgang Polonik, Davis

03.07. – 09.07.2016 **Learning Theory and Approximation**
Organizers: Andreas Christmann, Bayreuth
Kurt Jetter, Stuttgart
Steve Smale, Hong Kong
Ding-Xuan Zhou, Hong Kong

10.07. – 16.07.2016 **Calculus of Variations**
Organizers: Simon Brendle, Stanford
Alessio Figalli, Austin
Robert L. Jerrard, Toronto
Neshan Wickramasekera, Cambridge UK

17.07. – 23.07.2016 **Topologie**
Organizers: Mark Behrens, Notre Dame
Peter Teichner, Bonn
Nathalie Wahl, Copenhagen
Michael Weiss, Münster

24.07. – 30.07.2016 **Recent Mathematical Developments in Quantum Field Theory**
Organizers: Abdelmalek Abdesselam, Charlottesville
Stefan Hollands, Leipzig
Christoph Kopper, Palaiseau
Gandalf Lechner, Cardiff

31.07. – 06.08.2016 **Computational Group Theory**
Organizers: Bettina Eick, Braunschweig
Gerhard Hiß, Aachen
Derek Holt, Coventry
Eamonn O'Brien, Auckland

07.08. – 13.08.2016 **Arithmetic Geometry**
Organizers: Gerd Faltings, Bonn
Johan de Jong, New York
Peter Scholze, Bonn

14.08. – 20.08.2016 **Multiscale Interactions in Geophysical Fluids**
Organizers: Rupert Klein, Berlin
Shafer Smith, New York
Jacques Vanneste, Edinburgh

21.08. – 27.08.2016 **C*-Algebras**
Organizers: Mikael Rordam, Copenhagen
Andreas Thom, Dresden
Stefaan Vaes, Leuven
Dan-Virgil Voiculescu, Berkeley

28.08. – 03.09.2016 **Measured Group Theory**
Organizers: Miklos Abert, Budapest
Damien Gaboriau, Lyon
Andreas Thom, Dresden

04.09. – 10.09.2016 **Self-Adaptive Numerical Methods for Computationally Challenging Problems**
Organizers: Randy Bank, La Jolla
Zhiqiang Cai, West Lafayette
Rüdiger Verfürth, Bochum

11.09. – 17.09.2016 **Many-Body Quantum Systems and Effective Theories**
Organizers: Christian Hainzl, Tübingen
Benjamin Schlein, Zürich
Robert Seiringer, Klosterneuburg

18.09. – 24.09.2016 **Adaptive Algorithms**
Organizers: Carsten Carstensen, Berlin
Rob Stevenson, Amsterdam

18.09. – 24.09.2016 **Theory and Numerics of Inverse Scattering Problems**
Organizers: Fioralba Cakoni, Piscataway
Martin Hanke-Bourgeois, Mainz
Andreas Kirsch, Karlsruhe
William Rundell, College Station

25.09. – 01.10.2016 **Singularities**
Organizers: Francois Loeser, Paris
András Némethi, Budapest
Duco van Straten, Mainz

02.10. – 08.10.2016 **Mathematical and Algorithmic Aspects of Data Assimilation in the Geosciences**
Organizers: Andreas Griewank, Berlin
Sebastian Reich, Potsdam
Ian Roulstone, Guildford
Andrew Stuart, Coventry

23.10. – 29.10.2016 **Definability and Decidability Problems in Number Theory**
Organizers: Jochen Koenigsmann, Oxford
Hector Pasten, Cambridge MA
Alexandra Shlapentokh, Greenville
Xavier Vidaux, Concepción

06.11. – 12.11.2016 **Analytic Number Theory**
Organizers: Jörg Brüdern, Göttingen
Hugh L. Montgomery, Ann Arbor
Robert C. Vaughan, State College
Trevor D. Wooley, Bristol

13.11. – 19.11.2016 **Large Scale Stochastic Dynamics**
Organizers: Thierry Bodineau, Palaiseau
Fabio Toninelli, Villeurbanne
Bálint Tóth, Bristol/Budapest

27.11. – 03.12.2016 **Heat Kernels, Stochastic Processes and Functional Inequalities**
Organizers: Masha Gordina, Storrs
Takashi Kumagai, Kyoto
Laurent Saloff-Coste, Ithaca
Karl-Theodor Sturm, Bonn

04.12. – 10.12.2016 **Surface Bundles**
Organizers: Benson Farb, Chicago
Ursula Hamenstädt, Bonn
Andrew Ranicki, Edinburgh

11.12. – 17.12.2016 **Asymptotic Phenomena in Local Algebra and Singularity Theory**
Organizers: Aldo Conca, Genova
Steven Dale Cutkosky, Columbia
Srikanth B. Iyengar, Salt Lake City

Miniworkshops

07.02. – 13.02.2016 **Operator Spaces and Noncommutative Geometry in Interaction**
Organizers: Simon Brain, Nijmegen
Magnus Goffeng, Copenhagen
Jens Kaad, Nijmegen
Bram Mesland, Hannover

07.02. – 13.02.2016 **Applied Koopmanism**
Organizers: Didier Henrion, Toulouse
Igor Mezic, Santa Barbara
Mihai Putinar, Santa Barbara

07.02. – 13.02.2016 **Mathematical Foundations of Isogeometric Analysis**
Organizers: Tom Hughes, Austin
Bert Jüttler, Linz
Angela Kunoth, Köln
Bernd Simeon, Kaiserslautern

28.02. – 05.03.2016 **PBW Structures in Representation Theory**
Organizers: Evgeny Feigin, Moscow
Ghislain Fourier, Glasgow
Martina Lanini, Edinburgh

28.02. – 05.03.2016 **Arrangements of Subvarieties, and their Applications in Algebraic Geometry**
Organizers: Thomas Bauer, Marburg
Sandra Di Rocco, Stockholm
Brian Harbourne, Lincoln
Tomasz Szemberg, Krakow

28.02. – 05.03.2016 **Topological Complexity and Related Topics**
Organizers: Mark Grant, Aberdeen
Gregory Lupton, Cleveland
Lucile Vandembroucq, Braga

30.10. – 05.11.2016 **Fast Solvers for Highly Oscillatory Problems**
Organizers: Timo Betcke, London
Steffen Börm, Kiel
Sabine Le Borne, Hamburg-Harburg
Per-Gunnar Martinsson, Boulder

30.10. – 05.11.2016 **Mathematics of Magnetoelastic Materials**
Organizers: Carlos Garcia-Cervera, Santa Barbara
Martin Kruzik, Prague
Chun Liu, University Park
Anja Schlömerkemper, Würzburg

30.10. – 05.11.2016 **Computations in the Cohomology of Arithmetic Groups**
Organizers: Eva Bayer-Fluckiger, Lausanne
Philippe Elbaz-Vincent, Grenoble
Graham Ellis, Galway

18.12. – 23.12.2016 **New interactions between homotopical algebra and quantum field theory**
Organizers: Marco Benini, Potsdam
Kasia Rejzner, York
Alexander Schenkel, Regensburg
Christoph Schweigert, Hamburg

18.12. – 23.12.2016 **Max Dehn: his Life, Work, and Influence**
Organizers: David Peifer, Asheville
Volker Remmert, Wuppertal
David E. Rowe, Mainz
Marjorie Senechal, Northampton

18.12. – 23.12.2016 **Surreal Numbers, Surreal Analysis, Hahn Fields and Derivations**
Organizers: Alessandro Berarducci, Pisa
Philip Ehrlich, Athens
Salma Kuhlmann, Konstanz

Oberwolfach Seminare

15.05. – 21.05.2016 **Data Assimilation: The Mathematics of Connecting Dynamical Systems to Data**
Organizers: Jana de Wiljes, Potsdam
Sebastian Reich, Potsdam and Reading
Andrew Stuart, Warwick

15.05. – 21.05.2016 **Recent Advances on the Global Nonlinear Stability of Einstein Spacetimes**
Organizers: Mihalis Dafermos, Princeton
Philippe LeFloch, Paris
Qian Wang, Oxford

16.10. – 22.10.2016 **Berkovich Spaces and Degenerations of Calabi-Yau Varieties**
Organizers: Sebastian Boucksom, Paris
Mattias Jonsson, Michigan
Johannes Nicaise, London and Leuven

16.10. – 22.10.2016 **Perfectoid Spaces**
Organizers: Rebecca Bellovin, London
Brian Conrad, Stanford
Kiran Kedlaya, San Diego
Jared Weinstein, Boston

20.11. – 26.11.2016 **Different Mathematical Perspectives on Description of Unresolved Scales in Multiscale Systems**
Organizers: Carsten Hartmann, Berlin
Illia Horenko, Lugano
Rupert Klein, Berlin
Terence O'Kane, Hobart

20.11. – 26.11.2016 **Mathematical Theory of Evolutionary Fluid-Flow Structure Interactions**
Organizers: Barbara Kaltenbacher, Klagenfurt
Igor Kukavica, Los Angeles
Irena Lasiecka, Memphis
Roberto Triggiani, Memphis

Arbeitsgemeinschaften

03.04. – 09.04.2016 **The Geometric Langlands Conjecture**
Organizers: Laurent Fargues, Paris
Dennis Gaitsgory, Cambridge MA
Peter Scholze, Bonn
Kari Vilonen, Evanston

09.10. – 14.10.2016 **Diophantine Approximation, Fractal Geometry and Dynamics**
Organizers: Victor Beresnevich, York
Sanju Velani, York

Fortbildungen/Training activities

22.05. – 28.05.2016 **Trainings- und Abschluss-seminar für die Internationale Mathematik- Olympiade**
Organizer: Jürgen Prestin, Lübeck

2.3. Workshops

Workshop 1601

03.01. – 09.01.2016 **Model Theory: Groups, Geometry, and Combinatorics**

Organizers: Katrin Tent, Münster
Frank Wagner, Villeurbanne
Martin Ziegler, Freiburg

Abstract

This conference was about recent interactions of model theory with combinatorics, geometric group theory and the theory of valued fields, and the underlying pure model-theoretic developments. Its aim was to report on recent results in the area, and to foster communication between the different communities. There were a total of 20 talks plus a tutorial (three lectures) on elimination of imaginaries in the free group, and a tutorial (two lectures) on applications of model theory in combinatorics.

Participants

Altinel, Tuna (Villeurbanne), Baudisch, Andreas (Berlin), Bays, Martin (Hamilton), Ben Yaacov, Itai (Villeurbanne), Borovik, Alexandre (Manchester), Bouscaren, Elisabeth (Orsay), Breuillard, Emmanuel (Orsay), Brück, Benjamin (Münster), Casanovas, Enrique (Barcelona), Chatzidakis, Zoe (Paris), Cherlin, Gregory L. (Piscataway), Dahmani, Francois (Saint-Martin-d'Heres), de la Nuez González, Javier (Münster), Delon, Francoise (Paris), Deloro, Adrien (Paris), Dobrowolski, Jan (Wroclaw), Dupont, Katharina (Beer Sheva), Eleftheriou, Pantelis (Konstanz), Garcia, Dario (Villeurbanne), Guirardel, Vincent (Rennes), Halupczok, Immanuel (Leeds), Hasson, Assaf (Beer Sheva), Hempel, Nadja (Villeurbanne), Hils, Martin (Paris), Hrushovski, Ehud (Jerusalem), Jahnke, Franziska (Münster), Kaplan, Itay (Jerusalem), Kowalski, Piotr (Wroclaw), Krupinski, Krzysztof (Wroclaw), Kuhlmann, Salma (Konstanz), Levitt, Gilbert (Caen), Loeser, Francois (Paris), Louder, Larsen (London), MacPherson, H. Dugald (Leeds), Martin-Pizarro, Amador (Villeurbanne), Moosa, Rahim (Waterloo), Müller, Isabel (Münster), Newelski, Ludomir (Wroclaw), Palacín, Daniel (Münster), Peterzil, Kobi (Haifa), Point, Francoise (Mons), Scanlon, Thomas W. (Berkeley), Sela, Zlil (Jerusalem), Simon, Pierre (Villeurbanne), Sklinos, Rizos (Villeurbanne), Starchenko, Sergei S. (Notre Dame), Tent, Katrin (Münster), Thom, Andreas B. (Dresden), Wagner, Frank Olaf (Villeurbanne), Weidmann, Richard (Kiel), Wiscons, Joshua (Clinton), Ziegler, Martin (Freiburg i. Br.)

10.01. – 16.01.2016 **Graph Theory**

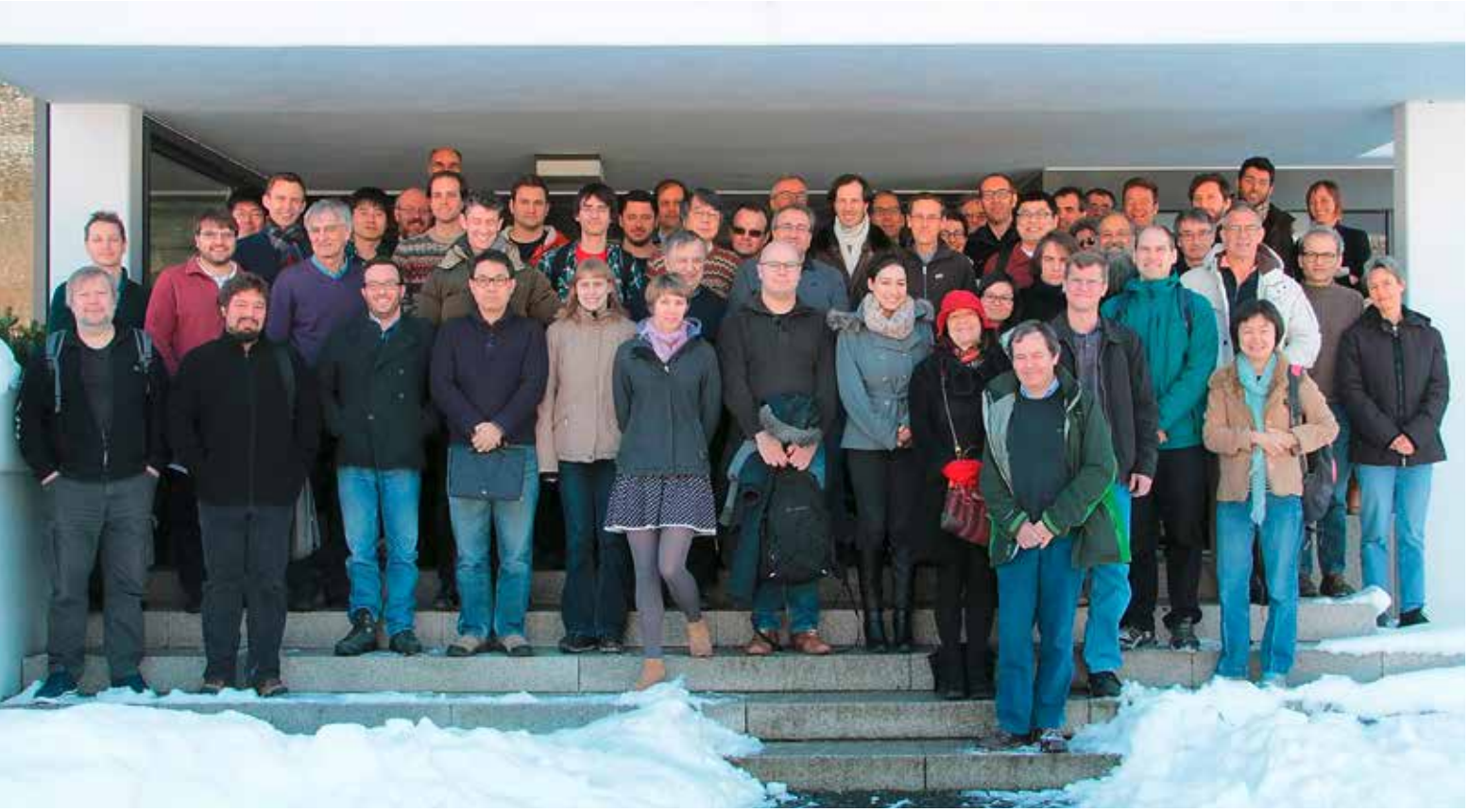
Organizers: Reinhard Diestel, Hamburg
Daniel Kral, Warwick
Paul Seymour, Princeton

Abstract

This workshop focused on four interlinked topics in in graph theory, which have recently seen exciting new developments: Nowhere-zero flows and the dual notion of graph colorings, sparsity of graphs and its algorithmic applications, width parameters and graph decompositions, and results following the proof of Rota's conjecture in matroid theory. The aim of the workshop was to offer a forum to communicate these developments and discuss directions for further research in the area.

Participants

Berger, Eli (Haifa), Bowler, Nathan (Hamburg), Bruhn, Henning (Ulm), Carmesin, Johannes (Cambridge), Charbit, Pierre (Paris), Chudnovsky, Maria (Princeton), Chuzhoy, Julia (Chicago), Conlon, David (Oxford), Diestel, Reinhard (Hamburg), Dvorak, Zdenek (Prague), Ene, Alina Raluca (Coventry), Fox, Jacob (Stanford), Geelen, James F. (Waterloo), Georgakopoulos, Agelos (Coventry), Grohe, Martin (Aachen), Hamann, Matthias (Hamburg), Hatami, Hamed (Montreal), Haxell, Penny E. (Waterloo), Hladky, Jan (Praha), Kaiser, Tomas (Pilsen), Klimosova, Tereza (Lyon), Kral, Daniel (Coventry), Kreutzer, Stephan (Berlin), Kühn, Daniela (Birmingham), Kun, Gabor (Budapest), Leader, Imre (Cambridge), Linial, Nathan (Jerusalem), Liu, Chun-Hung (Princeton), Lovász, László (Budapest), Lovász, László Miklós (Cambridge), Marx, Daniel (Budapest), Merker, Martin (Lyngby), Mohar, Bojan (Burnaby), Montgomery, Richard (Cambridge), Nelson, Peter (Waterloo), Nesetril, Jaroslav (Praha), Ossona de Mendez, Patrice (Paris), Osthus, Deryk (Birmingham), Pendavingh, Rudi (Eindhoven), Postle, Luke (Waterloo), Reiher, Christian (Hamburg), Schrijver, Alexander (Amsterdam), Schweitzer, Pascal (Aachen), Scott, Alexander (Oxford), Sereni, Jean-Sebastien (Villers-lès-Nancy), Seymour, Paul (Princeton), Soukup, Daniel T. (Calgary), Szegedy, Balazs (Budapest), Tardos, Gábor (Budapest), Thomassé, Stéphan (Lyon), Thomassen, Carsten (Lyngby), Volec, Jan (Zürich), Walters, Mark (London), Wollan, Paul (Roma)



17.01. – 23.01.2016 **Lattices and Applications in Number Theory**

Organizers: Renaud Coulangeon, Talence
Benedict Gross, Cambridge MA
Gabriele Nebe, Aachen

Abstract

The workshop brought together people working in various areas related to the field: classical geometry of numbers, packings, Diophantine approximation, Arakelov geometry, cohomology of arithmetic groups, algebraic modular forms and Hecke operators, algebraic topology. The meeting consisted of a few long talks which included an introductory part to each of the topics in the previous list, and a series of shorter talks mainly devoted to recent developments. The present report contains extended abstracts of all presentations.

Participants

Bacher, Roland (Saint-Martin-d'Heres), Bachoc, Christine (Talence), Bayer-Fluckiger, Eva (Lausanne), Böcherer, Siegfried (Mannheim), Borello, Martino (Lausanne), Bost, Jean-Benoit (Orsay), Braun, Oliver (Aachen), Chan, Wai Kiu (Middletown), Cho, Sungmun (Toronto), Cohn, Henry (Cambridge), Coulangeon, Renaud (Talence), Dostert, Maria (Köln), Dursthoff, David (Aachen), Dutour Sikiric, Mathieu (Zagreb), Elbaz-Vincent, Philippe (Saint-Martin-d'Heres), Ellis, Graham (Galway), Fintzen, Jessica (Cambridge), Fukshansky, Lenny (Claremont), Gaudron, Eric (Aubière), Greenberg, Matthew (Calgary), Ibukiyama, Tomoyoshi (Osaka), Jenkins, Paul (Provo), Kirschmer, Markus (Aachen), Korodi, Tamás (Aachen), Kühnlein, Stefan (Karlsruhe), Lannes, Jean (Palaiseau), Lansky, Joshua M. (Washington), Long, Ling (Baton Rouge), Meyer, Annika (Hagen), Miezaki, Tsuyoshi (Yamagata), Moustrou, Philippe (Talence), Nebe, Gabriele (Aachen), Pollack, David (Middletown), Rémond, Gaël (Saint-Martin-d'Hères), Ring, Maren Helene (Rostock), Rouse, Jeremy (Winston-Salem), Scharlau, Rudolf (Dortmund), Schönnenbeck, Sebastian (Aachen), Schoof, René (Roma), Schulze-Pillot, Rainer (Saarbrücken), Schürmann, Achill (Rostock), Schwermer, Joachim (Wien), Skoruppa, Nils-Peter (Siegen), Soulé, Christophe (Bures-sur-Yvette), Tran, Ha (Espoo), Turkalj, Ivica (Dortmund), Vallentin, Frank (Köln), Voight, John (Hanover), Walling, Lynne H. (Bristol), Watanabe, Takao (Osaka), Westerholt-Raum, Martin (Göteborg), Widmer, Martin (Surrey), Yasaki, Dan (Greensboro), Zimmermann, Marc-Christian (Dortmund)

24.01. – 30.01.2016 **Mathematical Imaging and Surface Processing**

Organizers: Antonin Chambolle, Palaiseau
Martin Rumpf, Bonn
Peter Schröder, Pasadena

Abstract

Within the last decade image and geometry processing have become increasingly rigorous with solid foundations in mathematics. Both areas are research fields at the intersection of different mathematical disciplines, ranging from geometry and calculus of variations to PDE analysis and numerical analysis. The workshop brought together scientists from all these areas. There was a lively exchange of ideas between geometry and image processing applications areas, characterized in a number of ways in this workshop. For example, optimal transport, first applied in computer vision is now used to define a distance measure between 3d shapes, spectral analysis as a tool in image processing can be applied in surface classification and matching, and so on. We have also seen the use of Riemannian geometry as a powerful tool to improve the analysis of multivalued images.

Participants

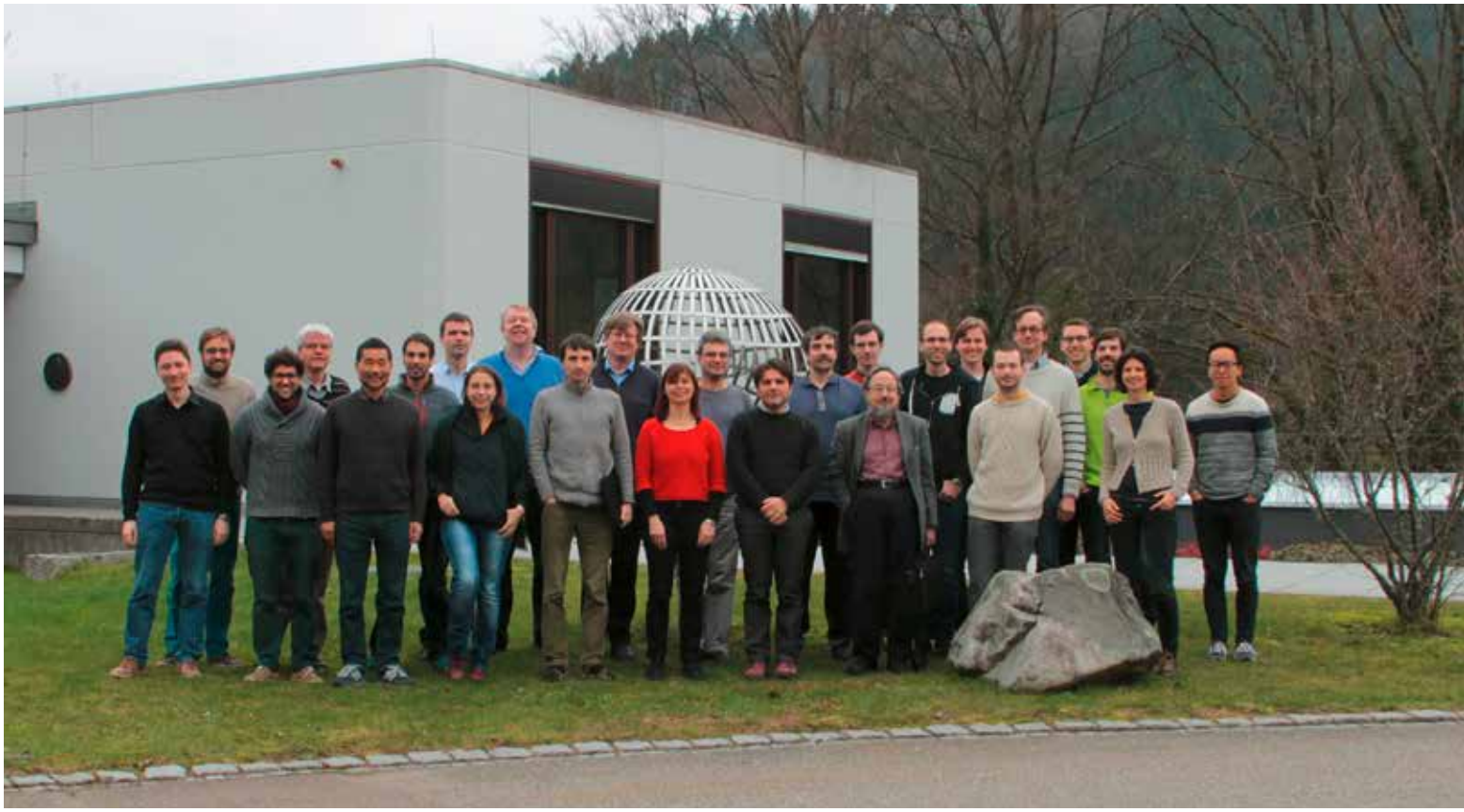
Alliez, Pierre (Sophia Antipolis), Azencot, Omri (Haifa), Ben-Chen, Mirela (Haifa), Bommes, David (Aachen), Bredies, Kristian (Graz), Bruveris, Martins (Uxbridge), Buet, Blanche (Orsay), Chambolle, Antonin (Palaiseau), Chern, Albert R. (Pasadena), Crane, Keenan (New York), Cremers, Daniel (Garching), Dossal, Charles (Talence), Duval, Vincent (Le Chesnay), Effland, Alexander (Bonn), Fadili, Jalal (Caen), Fritz, Hans (Regensburg), Gilboa, Guy (Haifa), Heeren, Behrend (Bonn), Hildebrandt, Klaus (Delft), Kilian, Martin (London), Kimmel, Ron (Haifa), Kobbelt, Leif (Aachen), Lipman, Yaron (Rehovot), Masnou, Simon (Villeurbanne), Mérigot, Quentin (Paris), Morozov, Dmitriy (Berkeley), Müller, Christian (Wien), Nikolova, Mila (Cachan), Novaga, Matteo (Pisa), Oudet, Edouard (Grenoble), Ovsjanikov, Maks (Palaiseau), Pennec, Xavier (Sophia Antipolis), Peyré, Gabriel (Paris), Pinkall, Ulrich (Berlin), Pock, Thomas G. (Graz), Rumpf, Martin (Bonn), Scherzer, Otmar (Wien), Schmitzer, Bernhard (Paris), Schoenlieb, Carola-Bibiane (Cambridge), Schröder, Peter (Pasadena), Sechelmann, Stefan (Berlin), Shtern, Alon (Haifa), Solomon, Justin (Cambridge), Steidl, Gabriele (Kaiserslautern), Stühmer, Jan (Garching), Trouvé, Alain (Cachan), Vouga, Etienne (Austin), Wardetzky, Max (Göttingen), Weickert, Joachim (Saarbrücken), Wirth, Benedikt (Münster), Zorin, Denis (New York)

31.01. – 06.02.2016 **Algebraic Cobordism and Projective Homogeneous Varieties**

Organizers: Stefan Gille, Edmonton
Marc Levine, Essen
Ivan Panin, St. Petersburg
Alexander Vishik, Nottingham

Abstract
The aim of this workshop was to bring together researchers in the theory of projective homogeneous varieties with researchers working on cohomology theories of algebraic varieties, so that the latter can learn about the needs in an area of successful applications of these abstract theories and the former can see the latest tools. The workshop has been attended by about 50 researchers from Europe, North and South-America and Asia, about 1/3 of them working on motives and/or $\mathbb{A}^1$-homotopy theory, 1/3 on quadratic forms and related topics as algebraic groups and projective homogeneous varieties, and 1/3 in both of these areas.

Participants
Ananyevskiy, Alexey (Princeton), Bachmann, Tom (München), Baek, Sanghoon (Daejeon), Becher, Karim Johannes (Antwerpen), Borovoi, Mikhail V. (Ramat Aviv, Tel Aviv), Brosnan, Patrick (College Park), Calmes, Baptiste (Lens), Chernousov, Vladimir (Edmonton), De Clercq, Charles (Villetaneuse), Druzhinin, Andrei (St. Petersburg), Fino, Raphael (Paris), Florence, Mathieu (Paris), Garkusha, Grigory (Swansea), Gille, Philippe (Villeurbanne), Gille, Stefan (Edmonton), Haution, Olivier (München), Heller, Jeremiah (Urbana), Hoffmann, Detlev (Dortmund), Hoyois, Marc (Cambridge), Hudson, Thomas (Daejeon), Karpenko, Nikita (Edmonton, Alberta), Kiritchenko, Valentina (Moscow), Krishna, Amalendu (Mumbai), Kunyavskii, Boris (Ramat Gan), Laghribi, Ahmed (Lens), Lee, Ting-Yu (Lausanne), Leep, David B. (Lexington), Levine, Marc (Essen), Luzgarev, Alexander (St. Petersburg), MacDonald, Mark (Lancaster), Nguyen Manh, Toan (Essen), Panin, Ivan A. (St. Petersburg), Parimala, Raman (Atlanta), Petrov, Victor A. (St. Petersburg), Quéguiner-Mathieu, Anne (Villetaneuse), Schlichting, Marco (Coventry), Scully, Stephen (Edmonton, Alberta), Sechin, Pavel (Moscow), Semenov, Nikita (München), Shinder, Evgeny (Sheffield), Stavrova, Anastasia (St. Petersburg), Tignol, Jean-Pierre (Louvain-la-Neuve), Unger, Thomas (Dublin), Vishik, Alexander (Nottingham), Yagita, Nobuaki (Ibaraki), Yagunov, Serge A. (St. Petersburg), Yakerson, Maria (Essen), Zainoulline, Kirill (Ottawa), Zhong, Changlong (Albany), Zhykhovich, Maksim (München)



14.02. – 20.02.2016 **Topological Recursion and TQFTs**

Organizers: Gaetan Borot, Bonn
Leonid Chekhov, Moscow
Bertrand Eynard, Gif-sur-Yvette
Katrin Wendland, Freiburg

Abstract

The topological recursion is an ubiquitous structure in enumerative geometry of surfaces and topological quantum field theories. Since its invention in the context of matrix models, it has been found or conjectured to compute intersection numbers in the moduli space of curves, topological string amplitudes, asymptotics of knot invariants, and more generally semiclassical expansion in topological quantum field theories. This workshop brought together mathematicians and theoretical physicists with various background to understand better the underlying geometry, learn about recent advances (notably on quantisation of spectral curves, topological strings and quantum gauge theories, and geometry of moduli spaces) and discuss the hot topics in the area.

Participants

Alim, Murad (Göttingen), Andersen, Jorgen E. (Aarhus), Belliard, Raphael (Gif-sur-Yvette), Borot, Gaetan (Bonn), Bouchard, Vincent (Edmonton, Alberta), Chekhov, Leonid O. (Moscow), Dimofte, Tudor D. (Princeton), Do, Norman (Victoria), Dumitrescu, Olivia M. (Bonn), Dunin-Barkowskiy, Petr (Bonn), Hollands, Lotte (Oxford), Hurtubise, Jacques (Montreal), Kashaev, Rinat M. (Geneve), Klemm, Albrecht (Bonn), Masbaum, Gregor (Paris), Milanov, Todor (Chiba), Mulase, Motohico (Davis), Orantin, Nicolas Gerson (Lausanne), Petit, Francois (Belvaux), Scheidegger, Emanuel (Freiburg i. Br.), Shapiro, Michael (East Lansing), Sulkowski, Piotr (Warszawa), Teschner, Jörg (Hamburg), Wendland, Katrin (Freiburg i. Br.), Zagier, Don B. (Bonn), Zenkevich, Yegor (Moscow)

14.02. – 20.02.2016 **Hochschild Cohomology in Algebra, Geometry, and Topology**

Organizers: Luchezar L. Avramov, Lincoln
Ragnar-Olaf Buchweitz, Toronto
Wendy Lowen, Antwerpen

Abstract
In 1945 Gerhard Hochschild published "On the cohomology groups of an associative algebra" in the "Annals of Mathematics" and thereby created what is now called Hochschild theory. In 1963, Murray Gerstenhaber proved that the Hochschild cohomology of any associative algebra carries a super-Poisson algebra structure, comprised of a graded commutative cup product and an odd super Lie algebra structure that acts through graded derivations with respect to the product. Subsequently, a number of higher structures have been discovered, and a vast body of research concerning and/or using Hochschild theory has developed in many different fields in mathematics and physics.

Participants
Avramov, Luchezar L. (Lincoln), Balzin, Eduard (Nice), Bergh, Petter A. (Trondheim), Buchweitz, Ragnar-Olaf (Toronto), Calaque, Damien (Montpellier), Flenner, Hubert (Bochum), Han, Yang (Beijing), Hermann, Reiner (Trondheim), Iyengar, Srikanth B. (Salt Lake City), Kaledin, Dmitry (Moscow), Linckelmann, Markus (London), Liu, Liyu (Yangzhou), Lowen, Wendy (Antwerpen), Negron, Cris (Baton Rouge), Redondo, Maria Julia (Bahia Blanca), Schedler, Travis (Austin), Shaul, Liran (Antwerpen), Solberg, Oyvind (Trondheim), Solotar, Andrea (Buenos Aires), Stanley, Donald (Regina, Saskatchewan), Van den Bergh, Michel (Diepenbeek), Volkov, Yury (St. Petersburg), Wang, Zhengfang (Paris), Witherspoon, Sarah (College Station), Zhang, James (Seattle), Zhou, Guodong (Shanghai), Zimmermann, Alexander (Amiens)

21.02. – 27.02.2016 **Asymptotic Geometric Analysis**

Organizers: Shiri Artstein-Avidan, Tel Aviv
Hermann König, Kiel
Alexander Koldobsky, Columbia

Abstract

The workshop was dedicated to new developments in Asymptotic Geometric Analysis, the study of high-dimensional geometric objects by analytic and probabilistic means, and its interplay with other fields such as functional analysis, convex geometry, probability and graph theory. A central aspect concerned volume inequalities for sections and projections of high-dimensional convex sets.

Participants

Artstein-Avidan, Shiri (Ramat Aviv, Tel Aviv), Bobkov, Sergey G. (Minneapolis), Cordero-Erausquin, Dario (Paris), Giannopoulos, Apostolos A. (Athens), Johnson, William B. (College Station), Klartag, Bo'az (Ramat Aviv, Tel Aviv), Koldobsky, Alexander (Columbia), König, Hermann (Kiel), Litvak, Alexander (Edmonton, Alberta), Meyer, Mathieu (Marne-la-Vallée), Milman, Emanuel (Haifa), Milman, Vitali D. (Ramat Aviv, Tel Aviv), Mordhorst, Olaf (Cleveland), Paouris, Grigoris (College Station), Pivovarov, Peter (Columbia), Rotem, Liran (Ramat Aviv, Tel Aviv), Rudelson, Mark (Ann Arbor), Schechtman, Gideon (Rehovot), Schneider, Rolf (Freiburg i. Br.), Slomka, Boaz (Ann Arbor), Szarek, Stanislaw J. (Cleveland), Tomczak-Jaegermann, Nicole (Edmonton, Alberta), Vritsiou, Beatrice-Helen (Ann Arbor), Werner, Elisabeth (Cleveland), Zvavitch, Artem (Kent)

21.02. – 27.02.2016 **New Developments in Functional and Highly Multivariate Statistical Methodology**

Organizers: Gerda Claeskens, Leuven
Holger Dette, Bochum
Irène Gijbels, Leuven
Peter Hall, Parkville VIC

Abstract
The central focus of the workshop was on recent developments in statistical techniques for highly multivariate data and functional data. The programme delivered talks on state-of-the-art research in the area, with a number of talks on highly-dimensional multivariate settings as well as talks dealing with functional data. The talks were followed by lively discussions on how to tackle difficult issues in the statistical methodology for such complex data.

Participants
Aue, Alexander (Davis), Betken, Annika (Bochum), Bradic, Jelena (La Jolla), Claeskens, Gerda (Leuven), Delaigle, Aurore (Parkville, Victoria), Dette, Holger (Bochum), Devijver, Emilie (Leuven), Gijbels, Irène (Leuven), Gonzalez-Manteiga, Wenceslao (Santiago de Compostela), Gueuning, Thomas (Leuven), Härdle, Wolfgang K. (Berlin), Hellton, Kristoffer (Oslo), Hörmann, Siegfried (Bruxelles), Hsing, Tailen (Ann Arbor), Janssen, Paul L. J. (Diepenbeek), Johannes, Jan (Heidelberg), Kneip, Alois R. (Bonn), Meister, Alexander (Rostock), Mueller, Hans-Georg (Davis), Munk, Axel (Göttingen), Nagy, Stanislav (Leuven), Rohde, Angelika (Bochum), Van Keilegom, Ingrid (Louvain-la-Neuve), Verhasselt, Anneleen (Diepenbeek), Wang, Jane-Ling (Davis), Yao, Qiwei (London)

06.03. – 12.03.2016 **Computationally and Statistically Efficient Inference for Complex Large-scale Data**

Organizers: Gilles Blanchard, Potsdam
Nicolai Meinshausen, Zürich
Richard Samworth, Cambridge
Ming Yuan, Madison

Abstract
The aim of the workshop was to foster dissemination and collaboration between researchers in the area of highdimensional and large-scale data analysis. The field has grown tremendously over the last decade. Faced with ever larger data sets, many algorithms have emerged in computer science, machine learning and statistics that allow computationally efficient manipulation and model fitting on large datasets. Yet the mathematical and statistical properties of these algorithms are only just beginning to be understood. Advancing the field is important to avoid many misleading scientific discoveries based on pure data manipulation without the accompanying mathematical insights. The talks and discussions at the workshop covered the latest advances from optimization to statistical error control for large-scale data analysis.

Participants
Bach, Francis (Paris), Balasubramanian, Krishnakumar (Madison), Berthet, Quentin (Cambridge), Blanchard, Gilles (Potsdam), Bühlmann, Peter (Zürich), Cai, T. Tony (Philadelphia), Carpentier, Alexandra (Cambridge), Castro, Rui M. (Eindhoven), Drton, Mathias (Seattle), Duchi, John (Stanford), Foygel Barber, Rina (Chicago), Gassiat, Elisabeth (Orsay), Giraud, Christophe (Palaiseau), Hastie, Trevor (Stanford), Heinze, Christina (Zürich), Jaggi, Martin (Zürich), Lafferty, John D. (Chicago), Lei, Jing (Pittsburgh), Levina, Elizaveta (Ann Arbor), Loh, Po-Ling (Philadelphia), Meinshausen, Nicolai (Zürich), Montanari, Andrea (Stanford), Mukherjee, Sach (Bonn), Munk, Axel (Göttingen), Negahban, Sahand (New Haven), Nowak, Robert D. (Madison), Obozinski, Guillaume (Marne-la-Vallée), Perkovic, Emilija (Zürich), Peters, Jonas (Tübingen), Raskutti, Garvesh (Madison), Richtarik, Peter (Edinburgh), Rigollet, Philippe (Cambridge), Rinaldo, Alessandro (Pittsburgh), Rohde, Angelika (Bochum), Rosasco, Lorenzo (Cambridge), Rosset, Saharon (Ramat Aviv, Tel Aviv), Rothenhaeusler, Dominik (Zürich), Samworth, Richard (Cambridge), Scott, Clayton (Ann Arbor), Shah, Rajen Dinesh (Cambridge), Spokoiny, Vladimir G. (Berlin), Thanei, Gian (Zürich), Tibshirani, Robert (Stanford), Tibshirani, Ryan (Pittsburgh), Wang, Tengyao (Cambridge), Wang, Yazhen (Madison), Willett, Rebecca (Madison), Yu, Yi (Cambridge), Yuan, Ming (Madison), Zhang, Cun-Hui (Piscataway), Zhang, Tong (Piscataway), Zhou, Huibin (New Haven)

13.03. – 19.03.2016 **Mechanics of Materials: Mechanics of Interfaces and Evolving Microstructure**

Organizers: Reinhold Kienzler, Bremen
David L. McDowell, Atlanta
Stefan Müller, Bonn
Ewald A. Werner, München

Abstract
Emphasis in modern day efforts in mechanics of materials is increasingly directed towards integration with computational materials science, which itself rests on solid physical and mathematical foundations in thermodynamics and kinetics of processes. Practical applications demand attention to length and time scales which are sufficiently large to preclude direct application of quantum mechanics approaches; accordingly, there are numerous pathways to mathematical modelling of the complexity of material structure during processing and in service. The conventional mathematical machinery of energy minimization provides guidance but has limited direct applicability to material systems evolving away from equilibrium. When microstructures evolve the associated classical mathematical frameworks are often ad hoc and heuristic. Advancing new and improved methods is a major focus of 21st century mechanics of materials of interfaces and evolving microstructure.

Participants
Abali, B. Emek (Berlin), Acharya, Amit (Pittsburgh), Altenbach, Holm (Magdeburg), Bertram, Albrecht (Magdeburg), Bieler, Thomas (East Lansing), Buehler, Markus (Cambridge), Chen, Long-Qing (University Park), Chen, Youping (Gainesville), Demkowicz, Michael J. (College Station), Döring, Lukas (Aachen), Gladbach, Peter (Bonn), Glüge, Rainer (Magdeburg), Hackl, Klaus (Bochum), Hochrainer, Thomas (Bremen), Ihlemann, Jörn (Chemnitz), James, Richard D. (Minneapolis), Kienzler, Reinhold (Bremen), Kochmann, Dennis M. (Pasadena), Kreisbeck, Carolin (Regensburg), Krempaszky, Christian (Garching), Latypov, Marat I. (Metz), Le, Khanh Chau (Bochum), Lipton, Robert (Baton Rouge), McDowell, David L. (Atlanta), Meier, Felix (Garching), Mesarovic, Sinisa (Pullman), Mielke, Alexander (Berlin), Müller, Stefan (Bonn), Neukamm, Stefan (Dresden), Pöttker, Henning (Bonn), Schlömerkemper, Anja (Würzburg), Schneider, Patrick (Bremen), Schröder, Jörg (Essen), Srolovitz, David J. (Philadelphia), Steinmann, Paul (Erlangen), Svendsen, Bob (Aachen), Wang, Yunzhi (Columbus), Warner, Derek H. (Ithaca), Werner, Ewald A. (Garching), Wulfinghoff, Stephan (Aachen), Zbib, Hussein M. (Pullman), Zhu, Ting (Atlanta), Zwicknagl, Barbara (Bonn)

20.03. – 26.03.2016 **Geometric Numerical Integration**

Organizers: Erwan Faou, Bruz/Paris
Ernst Hairer, Genève
Marlis Hochbruck, Karlsruhe
Christian Lubich, Tübingen

Abstract

The subject of this workshop was numerical methods that preserve geometric properties of the flow of an ordinary or partial differential equation: symplectic and multisymplectic integrators for Hamiltonian systems, symmetric integrators for reversible systems, methods preserving first integrals and numerical methods on manifolds, including Lie group methods and integrators for constrained Hamiltonian mechanics, and methods for problems with highly oscillatory solutions. This was complemented by the question as to how structure preservation affects the long-time behaviour of numerical methods.

Participants

Abdulle, Assyr (Lausanne), Bader, Philipp (Melbourne), Bambusi, Dario (Milano), Bao, Weizhu (Singapore), Blanes, Sergio (Valencia), Buchholz, Simone (Karlsruhe), Calvo, Maria Paz (Valladolid), Cano, Begoña (Valladolid), Casas, Fernando (Castellon), Celledoni, Elena (Trondheim), Chartier, Philippe (Rennes), Chen, Chuchu (West Lafayette), Cohen, David (Umea), Crouseilles, Nicolas (Rennes), Einkemmer, Lukas (Innsbruck), Engquist, Björn (Austin), Faou, Erwan (Bruz), Gauckler, Ludwig (Berlin), Gay-Balmaz, Francois (Paris), Grébert, Benoit (Nantes), Grimm, Volker (Karlsruhe), Hairer, Ernst (Geneve), Hochbruck, Marlis (Karlsruhe), Iserles, Arieh (Cambridge), Itoh, Toshiaki (Kyotanabe City), Jahnke, Tobias (Karlsruhe), Jin, Shi (Madison), Kieri, Emil (Bonn), Laskar, Jacques (Paris), Leok, Melvin (La Jolla), Lubich, Christian (Tübingen), Maddocks, John H. (Lausanne), McLachlan, Robert (Palmerston North), Miyatake, Yuto (Nagoya), Modin, Klas (Göteborg), Munthe-Kaas, Hans Z. (Bergen), Ostermann, Alexander (Innsbruck), Owren, Brynjulf (Trondheim), Paturel, Eric (Nantes), Quispel, Reinout (Victoria), Reich, Sebastian (Potsdam), Rousset, Frédéric (Rennes), Sanz-Serna, J.M. (Leganes), Schratz, Katharina (Karlsruhe), Sonnendrücker, Eric (Garching), Stern, Ari (St. Louis), Suris, Yuri B. (Berlin), Tsai, Yen-Hsi Richard (Austin), Vaillant, Timothée (Paris), Vermeeren, Mats (Berlin), Vilmart, Gilles (Geneve), Wanner, Gerhard (Geneve), Zanna, Antonella (Bergen)

27.03. – 02.04.2016 **Toric Geometry**

Organizers: Jürgen Hausen, Tübingen
Diane Maclagan, Coventry
Hal Schenck, Urbana

Abstract

Toric geometry is a subfield of algebraic geometry with deep intersections with combinatorics. This workshop brought together researchers working in all aspects of the subject. The talks presented current developments and recent results in "classical" toric geometry, toric-inspired topics, and the use of toric tools in other fields ranging from algebraic geometry via commutative algebra, topology and arithmetic geometry to applications.

Participants

Adiprasito, Karim (Jerusalem), Altmann, Klaus (Berlin), Arzhantsev, Ivan (Moscow), Batyrev, Victor V. (Tübingen), Brion, Michel (Saint-Martin-d'Heres), Brown, Gavin D. (Coventry), Brown, Morgan V. (Coral Gables), Cartwright, Dustin (Knoxville), Casagrande, Cinzia (Torino), Craw, Alastair (Bath), de Cataldo, Mark A. (Stony Brook), Dickenstein, Alicia (Buenos Aires), Di Rocco, Sandra (Stockholm), Giansiracusa, Noah (Athens), Gonzalez, Jose Luis (New Haven), Grassi, Antonella (Philadelphia), Gubler, Walter (Regensburg), Haase, Christian (Berlin), Hampe, Simon (Berlin), Hausen, Jürgen (Tübingen), He, Yang-Hui (London), Hering, Milena (Edinburgh), Heuver, Stefan (Essen), Huh, June E. (Princeton), Ilten, Nathan Owen (Burnaby), Ito, Atsushi (Kyoto), Karu, Kalle (Vancouver), Kasprzyk, Alexander (Nottingham), Katz, Eric E. (Waterloo), Kaveh, Kiumars (Pittsburgh), Keicher, Simon (Concepcion), Kiritchenko, Valentina (Moscow), Kohn, Kathlén (Berlin), Laface, Antonio (Concepcion), Lasoń, Michał (Berlin), Maclagan, Diane (Coventry), Manon, Christopher (Fairfax), Michalek, Mateusz (Warszawa), Mustata, Mircea (Ann Arbor), Nicolussi, Michele (Tübingen), Nill, Benjamin (Magdeburg), Ottem, John Christian (Cambridge), Satriano, Matthew (Waterloo), Schenck, Henry K. (Urbana), Smith, Gregory G. (Kingston, Ont.), Sturmfels, Bernd (Berkeley), Sullivant, Seth (Raleigh), Süß, Hendrik (Manchester), Teissier, Bernard (Paris), Tseng, Hsian-Hua (Columbus), Ueda, Kazushi (Tokyo), Ulirsch, Martin (Bonn), Wisniewski, Jaroslaw (Warszawa)

10.04. – 16.04.2016 **Diophantische Approximationen**

Organizers: Yann Bugeaud, Strasbourg
Philipp Habegger, Basel
Umberto Zannier, Pisa

Abstract

This number theoretic conference was focused on a broad variety of subjects in (or closely related to) Diophantine approximation, including the following: metric Diophantine approximation, Mahler's method in transcendence, geometry of numbers, theory of heights, arithmetic dynamics, function fields arithmetic. There have been 51 participants with broad geographic representation and a large variety of mathematical backgrounds. Young researchers were well represented, including among the speakers.

Participants

Adamczewski, Boris (Marseille), Akhtari, Shabnam (Eugene), Amoroso, Francesco (Caen), Badziahin, Dzmitry (Durham), Bell, Jason P. (Waterloo), Bennett, Michael A. (Vancouver), Beresnevich, Victor (Heslington, York), Bertrand, Daniel (Paris), Bilu, Yuri (Talence), Bugeaud, Yann (Strasbourg Cedex), Chevallier, Nicolas (Mulhouse), Corvaja, Pietro (Udine), Delaygue, Eric (Villeurbanne), Evertse, Jan-Hendrik (Leiden), Fuchs, Clemens (Salzburg), Gao, Ziyang (Paris), Gaudron, Eric (Aubière), Habegger, Philipp (Basel), Haynes, Alan (Heslington, York), Hindry, Marc (Paris), Hirata-Kohno, Noriko (Tokyo), Ingram, Patrick (Fort Collins), Kreso, Dijana (Graz), Krieger, Holly (Cambridge), Kühne, Lars (Bonn), Laurent, Michel (Marseille), Levin, Aaron D. (East Lansing), Lindenstrauss, Elon (Jerusalem), Lombardo, Davide (Orsay), Marnat, Antoine (Graz), Maurin, Guillaume (Paris), Moshchevitin, Nikolay G. (Moscow), Nesterenko, Yuri V. (Moscow), Pazuki, Fabien (Copenhagen), Philippon, Patrice (Paris), Pottmeyer, Lukas (Basel), Rémond, Gaël (Saint-Martin-d'Hères), Rivoal, Tanguy (Saint-Martin-d'Heres), Roy, Damien (Ottawa), Schmidt, Harry (Oxford), Silverman, Joseph H. (Providence), Tucker, Thomas (Rochester), Varju, Peter (Cambridge), Velani, Sanju (Heslington, York), Viola, Carlo (Pisa), Waldschmidt, Michel (Paris), Widmer, Martin (Surrey), Zannier, Umberto (Pisa), Zieve, Michael (Ann Arbor), Zorin, Evgeniy (Heslington, York), Zudilin, Wadim (Callaghan, Newcastle)

17.04. – 23.04.2016 **Combinatorics and Probability**

Organizers: Bela Bollobás, Cambridge UK
Michael Krivelevich, Tel Aviv
Oliver Riordan, Oxford
Emo Welzl, Zürich

Abstract

For the past few decades, Combinatorics and Probability Theory have had a fruitful symbiosis, each benefitting from and influencing developments in the other. Thus to prove the existence of designs, probabilistic methods are used, algorithms to factorize integers need combinatorics and probability theory (in addition to number theory), and the study of random matrices needs combinatorics. In the workshop a great variety of topics exemplifying this interaction were considered, including problems concerning designs, Cayley graphs, additive number theory, multiplicative number theory, noise sensitivity, random graphs, extremal graphs and random matrices.

Participants

Alon, Noga (Tel Aviv), Balister, Paul (Memphis), Balogh, Jozsef (Urbana), Barany, Imre (Budapest), Bohman, Thomas A. (Pittsburgh), Bollobás, Béla (Cambridge), Coja-Oghlan, Amin (Frankfurt), Conlon, David (Oxford), Dvir, Zeev (Princeton), Fox, Jacob (Stanford), Friedgut, Ehud (Rehovot), Furedi, Zoltan (Budapest), Gamarnik, David (Cambridge), Gunderson, Karen (Winnipeg), Haxell, Penny E. (Waterloo), Hetterich, Samuel (Frankfurt), Holmgren, Cecilia (Uppsala), Janson, Svante (Uppsala), Kahn, Jeff (Piscataway), Kang, Mihyun (Graz), Keevash, Peter (Oxford), Kim, Jeong Han (Seoul), Kohayakawa, Yoshiharu (Sao Paulo), Krivelevich, Michael (Tel Aviv), Lee, Jonathan D. (Oxford), Lengler, Johannes (Zürich), Letzter, Shoham (Cambridge), Linial, Nathan (Jerusalem), Long, Eoin Patrick (Ramat Aviv, Tel Aviv), Lubetzky, Eyal (New York), Luczak, Tomasz (Poznan), Narayanan, Bhargav P. (Cambridge), Pach, Janos (Lausanne), Panagiotou, Konstantinos (München), Riordan, Oliver M. (Oxford), Rödl, Vojtech (Atlanta), Rucinski, Andrzej (Poznan), Samotij, Wojciech (Tel Aviv), Schacht, Mathias (Hamburg), Scott, Alexander (Oxford), Shapira, Asaf (Ramat Aviv, Tel Aviv), Solymosi, József (Vancouver), Steger, Angelika (Zürich), Sudakov, Benjamin (Zürich), Szabó, Tibor (Berlin), Taraz, Anusch (Hamburg), Tardos, Gábor (Budapest), Thomason, Andrew (Cambridge), Vu, Van H. (New Haven), Warnke, Lutz (Cambridge), Welzl, Emo (Zürich), Wormald, Nicholas (Clayton), Zhao, Yufei (Oxford)

24.04. – 30.04.2016 **Moduli spaces and Modular forms**

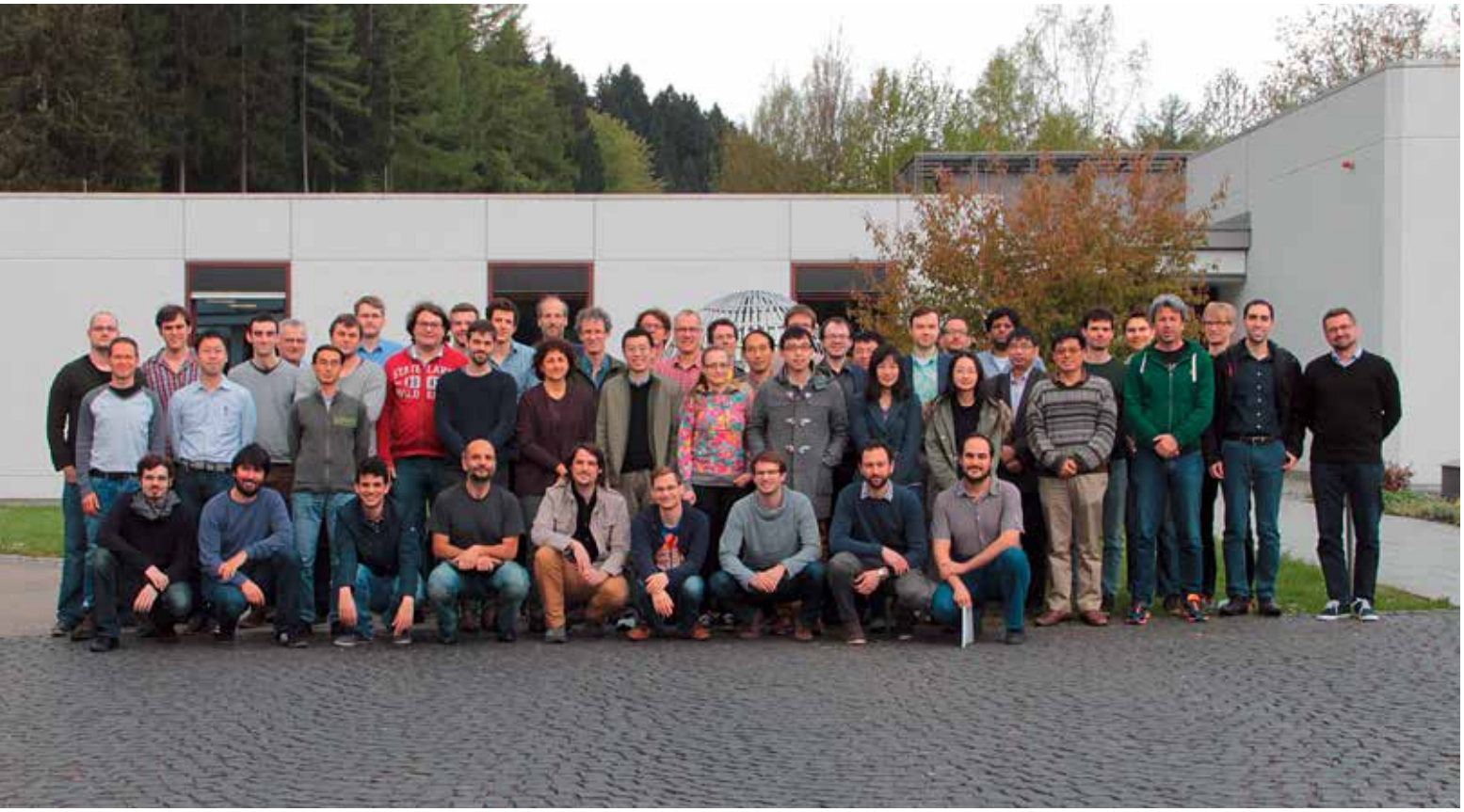
Organizers: Jan Hendrik Bruinier, Darmstadt
Gerard van der Geer, Amsterdam
Valery Gritsenko, Villeneuve d'Ascq

Abstract

The roots of both moduli spaces and modular forms go back to the theory of elliptic curves in the 19th century. Both topics have seen an enormous growth in the second half of the 20th century, but the interaction between the two remained limited. Recently there have been new developments that led to new points of contact between the two topics. One is the theory of K3 surfaces that is rapidly gaining a lot of new interest. Here the link with modular forms on orthogonal groups has led to progress on the Kodaira dimension of the moduli spaces of K3 surfaces. Another new development has been the use of moduli spaces of curves to gather new information about Siegel modular forms. The workshop intended to bring representatives from both the theory of moduli and the theory of modular forms together to further the interaction between the two topics as the time seemed ripe to do this.

Participants

Andreatta, Fabrizio (Milano), Bajpai, Jitendra (Bonn), Bergström, Jonas (Stockholm), Bringmann, Kathrin (Köln), Bruinier, Jan Hendrik (Darmstadt), Cléry, Fabien (Siegen), Deitmar, Anton (Tübingen), Ehlen, Stephan (Montreal), Faber, Carel F. (Utrecht), Farkas, Gavril (Berlin), Fiorentino, Alessio (Rennes), Funke, Jens (Durham), Galkin, Sergey (Moscow), Garbagnati, Alice (Milano), Gritsenko, Valery (Villeneuve d'Ascq.), Grushevsky, Samuel (Stony Brook), Hofmann, Eric (Heidelberg), Hulek, Klaus (Hannover), Katsura, Toshiyuki (Tokyo), Kondo, Shigeyuki (Nagoya), Kramer, Jürg (Berlin), Kudla, Stephen S. (Toronto), Laza, Radu (Stony Brook), Li, Yingkun (Darmstadt), Liedtke, Christian (Garching bei München), Looijenga, Eduard J. N. (Beijing), Ma, Shouhei (Tokyo), Möller, Martin (Frankfurt), Neururer, Michael (Darmstadt), Nikulin, Viacheslav V. (Liverpool), Opitz, Sebastian (Darmstadt), Petersen, Dan (Copenhagen), Poor, Cris (Bronx), Salvati Manni, Riccardo (Roma), Sankaran, Gregory (Bath), Scheithauer, Nils (Darmstadt), Schütt, Matthias (Hannover), Schwagenscheidt, Markus (Darmstadt), Shepherd-Barron, Nick I. (London), Shurman, Jerry (Portland), Skoruppa, Nils-Peter (Siegen), Taibi, Olivier N. (London), van der Geer, Gerard (Amsterdam), Viazovska, Maryna (Berlin), von Pippich, Anna (Darmstadt), Westerholt-Raum, Martin (Göteborg), Woodbury, Michael C. (Köln), Yang, Tonghai (Madison), Yoshikawa, Ken-Ichi (Kyoto), Yuen, David S. (Lake Forest), Yui, Noriko (Kingston, Ont.), Zemel, Shaul (Jerusalem)



01.05. – 07.05.2016 **Rough Paths, Regularity Structures and Related Topics**

Organizers: Thomas Cass, London
Peter Friz, Berlin
Massimilliano Gubinelli, Paris

Abstract

Since its original development in the mid-nineties by T. Lyons the theory of rough paths, based on the profound insight that stochastic differential equations can be solved pathwise and that the solution map is continuous in suitable rough path metrics, has grown into a mature and widely applicable mathematical theory. Spectacular recent progress was made by Hairer and then Gubinelli-Imkeller-Perkowski with their respective extensions of rough paths to "rough fields" capable of giving meaning and robust solutions theories to a number of singular non-linear stochastic partial differential equations (SPDEs). The aims of the workshop were to develop insights and applications on classical rough path theory on the one side, and to investigate non-linear SPDEs and regularity structures on the other.

Participants

Abdesselam, Abdelmalek (Charlottesville), Aida, Shigeki (Sendai), Bailleul, Ismael (Rennes), Bayer, Christian (Berlin), Boedihardjo, Horatio (Reading), Bruned, Yvain (Coventry), Cannizzaro, Giuseppe (Berlin), Cass, Thomas R. (London), Catellier, Remi (Rennes), Chandra, Ajay (Coventry), Chevyrev, Ilya (Berlin), Chouk, Khalil (Berlin), Crisan, Dan (London), Deya, Aurélien (Vandoeuvre-les-Nancy), Diehl, Joscha (Berlin), Fehrman, Benjamin (Leipzig), Friz, Peter K. (Berlin), Gassiat, Paul (Paris), Geng, Xi (Oxford), Gess, Benjamin (Bielefeld), Gubinelli, Massimiliano (Bonn), Hairer, Martin (Coventry), Hambly, Ben (Oxford), Hocquet, Antoine (Palaiseau), Hofmanová, Martina (Berlin), Imkeller, Peter (Berlin), Inahama, Yuzuru (Fukuoka), Kalbasi, Kamran (Coventry), Kawabi, Hiroshi (Okayama), Kupiainen, Antti (Helsinki), Labbe, Cyril (Coventry), Litterer, Christian (Heslington, York), Lyons, Terence J. (Oxford), Martin, Jörg (Berlin), Matetski, Konstantin (Toronto, Ontario), Maurelli, Mario (Berlin), Nahmod, Andrea R. (Amherst), Ni, Hao (Oxford), Oberhauser, Harald (Oxford), Perkowski, Nicolas (Berlin), Prömel, David (Zürich), Qian, Zhongmin (Oxford), Riedel, Sebastian (Berlin), Shen, Hao (New York), Teichmann, Josef (Zürich), Tindel, Samy (Vandoeuvre-les-Nancy), Touzi, Nizar (Palaiseau), Weber, Hendrik (Coventry), Weidner, Martin (London), Xu, Weijun (Coventry), Yang, Danyu (Oxford), Zambotti, Lorenzo (Paris), Zhang, Jianfeng (Los Angeles)

08.05. – 14.05.2016 **Factorization Algebras and Functorial Field Theories**

Organizers: Owen Gwilliam, Bonn
Stephan Stolz, Notre Dame
Peter Teichner, Bonn
Mahmoud Zeinalian, New York

Abstract

Factorization algebras are a new mathematical approach to quantum field theory. They are related to functorial field theories, another approach to quantum field theory. Factorization algebras also figure in current research in manifold topology, homotopy theory and algebraic geometry. The workshop brought together researchers from many different fields to understand and deepen these connections.

Participants

Arnold, Bertram (Bonn), Blohmann, Christian (Bonn), Brav, Christopher (Moscow), Brügmann, Daniel (Bonn), Bunke, Ulrich (Regensburg), Caldararu, Andrei (Madison), Cliff, Emily (Oxford), Cui, Xiaoyi (Göttingen), Dugger, Daniel K. (Eugene), Elliott, Chris (Evanston), Fukaya, Kenji (Stony Brook), Gepner, David J. (West Lafayette), Gorbunov, Vassily (Aberdeen), Grady, Ryan E. (Bozeman), Gwilliam, Owen (Bonn), Haugseng, Rune (Copenhagen), Henriques, André G. (Oxford), Idrissi, Najib (Villeneuve d'Ascq.), Johnson-Freyd, Theo (Evanston), Kandel, Santosh (Bonn), Kapranov, Mikhail (Kashiwa), Knudsen, Benjamin (Evanston), Kong, Liang (Durham), Li, Si (Beijing), Masbaum, Gregor (Paris), Mazel-Gee, Aaron (Berkeley), Mnev, Pavel (Bonn), Morrison, Scott (Acton), Nariman, Sam (Münster), Nikolaus, Thomas (Bonn), Pavlov, Dmitri (Regensburg), Rabinovich, Eugene (Berkeley), Rejzner, Kasia (Heslington, York), Runkel, Ingo (Hamburg), Safronov, Pavel (Oxford), Schaumann, Gregor (Wien), Scheimbauer, Claudia I. (Bonn), Schommer-Pries, Chris (Bonn), Schweigert, Christoph (Hamburg), Stolz, Stephan (Notre Dame), Strobl, Thomas (Villeurbanne), Stroppel, Catharina (Bonn), Tanaka, Hiro Lee (Cambridge), Teichner, Peter (Bonn), Tillmann, Ulrike (Oxford), Valentino, Alessandro (Bonn), Waldorf, Konrad (Greifswald), Walker, Kevin (Moab), Williams, Brian (Evanston), Zeinalian, Mahmoud (Brookville)

22.05. – 28.05.2016 **The Renormalization Group**

Organizers: Wojciech De Roeck, Leuven
Margherita Disertori, Bonn
Manfred Salmhofer, Heidelberg

Abstract

The renormalization group was originally introduced as a multiscale approach to quantum field theory and the theory of critical phenomena, explaining in particular the universality observed e.g. in critical exponents. Since then it has become a hugely important tool in statistical mechanics, condensed matter and high energy physics. More recently, renormalization has also played a decisive role in mathematics as a method of proof, applicable in quantum field theory, differential equations, probability, and other fields. The workshop has focused on new developments along the lines of these two traditions. Besides discussing methodical progress and current applications, we have explored new challenges and problems that may in the future be tackled with the help of the renormalization group.

Participants

Abdesselam, Abdelmalek (Charlottesville), Adams, Stefan (Coventry), Bauerschmidt, Roland (Cambridge), Bols, Alexander (Leuven), Brydges, David C. (Vancouver), Buchholz, Simon (Bonn), Cenatiempo, Serena (L'Aquila (AQ)), Chandra, Ajay (Coventry), Crawford, Nicholas J. (Haifa), de Roeck, Wojciech (Leuven), Dimock, Jonathan (Buffalo), Disertori, Margherita (Bonn), Erdös, Laszlo (Klosterneuburg), Feldman, Joel (Vancouver), Fröhlich, Jürg M. (Zürich), Gawedzki, Krzysztof (Lyon), Giuliani, Alessandro (Roma), Gurau, Razvan (Palaiseau), Hilger, Susanne (Bonn), Hollands, Stefan (Leipzig), Jauslin, Ian (Zürich), Knörrer, Horst (Zürich), Kopper, Christoph (Palaiseau), Kotecký, Roman (Coventry), Lager, Mareike (Bonn), Lohmann, Martin (Zürich), Lukkarinen, Jani (Helsinki), Müger, Michael (Nijmegen), Müller, Stefan (Bonn), Nguyen, Timothy (East Lansing), Pizzo, Alessandro (Roma), Porta, Marcello (Zürich), Rejzner, Kasia (Heslington, York), Rivasseau, Vincent (Orsay), Salmhofer, Manfred (Heidelberg), Seiler, Erhard (München), Sibold, Klaus (Leipzig), Sigal, Michael (Toronto), Slade, Gordon (Vancouver), Ueltschi, Daniel (Coventry), Vignes-Tourneret, Fabien (Villeurbanne), Warzel, Simone (Garching bei München), Zirnbauer, Martin (Köln)

29.05. – 04.06.2016 **Nonlinear Evolution Problems**

Organizers: Klaus Ecker, Berlin
Jalal Shatah, New York
Gigliola Staffilani, Cambridge MA
Michael Struwe, Zürich

Abstract

There was a wide spectrum of topics discussed at the workshop on "Nonlinear Evolution Problems" that, however, all can be grouped into the main themes of geometric evolution equations or dispersive equations, including nonlinear wave and Schrödinger equations. Altogether there were 21 talks, presented by leading specialists from all over the world. Each morning, three 45-minute lectures were delivered, and on average two in the afternoon, thus leaving ample time for in-depth discussion among the participants of our meeting.

Participants

Afuni, Ahmad (Hannover), Bedrossian, Jacob (College Park), Bourni, Theodora (Berlin), Buckmaster, Tristan J. (New York), Buzano, Reto (London), Cote, Raphael (Palaiseau), Dalibard-Roux, Anne-Laure (Paris Cedex), Daskalopoulos, Panagiota (New York), Deng, Yu (New York), Dittberner, Friederike (Berlin), Dodson, Benjamin (Baltimore), Fan, Chenjie (Cambridge), Faou, Erwan (Bruz), Germain, Pierre (New York), Gianniotis, Panagiotis (London), Hani, Zaher (Atlanta), Harrop-Griffiths, Benjamin (New York), Haslhofer, Robert (Toronto), Huisken, Gerhard (Tübingen), Ifrim, Mihaela (Berkeley), Ionescu, Alexandru D. (Princeton), Ivanovici, Oana (Nice), Jachan, Felix (Dresden), Koch, Herbert (Bonn), Krieger, Joachim (Lausanne), Lahiri, Ananda (Golm), Langford, Mathew (Berlin), Lawrie, Andrew (Berkeley), Lenzmann, Enno (Basel), Lührmann, Jonas (Zürich), Mendelson, Dana (Princeton), Munoz, Claudio (Orsay), Nahmod, Andrea R. (Amherst), Oh, Sung-Jin (Berkeley), Pausader, Benoit (Providence), Pavlovic, Natasa (Austin), Planchon, Fabrice (Nice), Pusateri, Fabio (Princeton), Rupflin, Melanie (Oxford), Schnürer, Oliver C. (Konstanz), Schulz, Mario B. (Zürich), Schulze, Felix (London), Shatah, Jalal (New York), Simon, Miles (Magdeburg), Sohinger, Vedran (Zürich), Staffilani, Gigliola (Cambridge), Struwe, Michael (Zürich), Tataru, Daniel (Berkeley), Thomann, Laurent (Vandoeuvre-les-Nancy), Tzvetkov, Nikolay (Cergy-Pontoise), Waldron, Alex (Stony Brook)

05.06. – 11.06.2016
Organizers:

Geometrie
John Lott, Berkeley
André Neves, London
Iskander Taimanov, Novosibirsk
Burkhard Wilking, Münster

Abstract
The workshop Geometry was well attended with over 53 participants with broad geographic representation from all continents. Compared to previous meetings there were for example quite a few young Brazilian postdocs at the meeting. The emphasize on min-max problems and related fields was somewhat increased. The format of the meeting consisted of 18 one hour talks and four half hour afterdinner talks. The after-dinner talks were given by PhD students and recent PhDs. The schedule left lots of room for discussions in between talks.

Participants
Albuquerque, Rui (Evora), Ambrozio, Lucas (London), Angenent, Sigurd B. (Madison), Beitz, Franziska (Münster), Bettiol, Renato G. (Philadelphia), Böhm, Christoph (Münster), Cabezas-Rivas, Esther (Frankfurt), Carlotto, Alessandro (Zürich), Dai, Xianzhe (Santa Barbara), Dessai, Anand N. (Fribourg), Galaz-Garcia, Fernando (Karlsruhe), Gayfullin, Alexander A. (Moscow), Große, Nadine (Freiburg i. Br.), Hamenstädt, Ursula (Bonn), Haslhofer, Robert (Toronto), Herrmann, Martin (Münster), Hingston, Nancy (Ewing), Honda, Shouhei (Sendai), Ivanov, Sergei V. (St. Petersburg), Jansen, Dorothea (Münster), Kerin, Martin (Münster), Ketover, Dan (London), Knopf, Dan (Austin), Lafuente, Ramiro (Münster), Liokumovich, Yevgeny (London), Lott, John (Berkeley), Ludewig, Matthias (Potsdam), Lytchak, Alexander (Köln), Matthiesen, Henrik (Bonn), Máximo, Davi (Stanford), Mendes, Ricardo (Münster), Montezuma, Rafael (Princeton), Nepechiy, Artem (Münster), Neves, André A. (London), Ni, Lei (La Jolla), Nunes, Ivaldo (Rio de Janeiro), Petrunin, Anton (University Park), Radeschi, Marco (Münster), Roos, Saskia (Bonn), Sarquis Aiex, Nicolau (London), Schulze, Felix (London), Simon, Miles (Magdeburg), Sinestrari, Carlo (Roma), Stadler, Stephan (München), Sturm, Karl-Theodor (Bonn), Sun, Song (Stony Brook), Taimanov, Iskander A. (Novosibirsk), Topping, Peter M. (Coventry), Wei, Guofang (Santa Barbara), Weinkove, Ben (Evanston), Wickramasekera, Neshan (Cambridge), Wilking, Burkhard (Münster), Zhang, Zhou (Sydney)

12.06. – 18.06.2016 **Classical Algebraic Geometry**

Organizers: Olivier Debarre, Paris
David Eisenbud, Berkeley
Gavril Farkas, Berlin
Ravi Vakil, Stanford

Abstract

Progress in algebraic geometry often comes through the introduction of new tools and ideas to tackle the classical problems the development of the field. Examples include new invariants that capture some aspect of geometry in a novel way, such as the derived category, and the extension of the class of geometric objects considered to allow constructions not previously possible, such as the transition from varieties to schemes or from schemes to stacks. Many famous old problems and outstanding conjectures have been resolved in this way over the last 50 years. While the new theories are sometimes studied for their own sake, they are in the end best understood in the context of the classical questions they illuminate. The goal of the workshop was to study new developments in algebraic geometry, with a view toward their application to the classical problems.

Participants

Abramovich, Dan (Providence), Alexeev, Valery (Athens), Bakker, Ben (Berlin), Bangere, Purnaprajna (Lawrence), Beauville, Arnaud (Nice), Benoist, Olivier (Strasbourg), Bopp, Christian (Saarbrücken), Borisov, Lev A. (Piscataway), Casagrande, Cinzia (Torino), Castravet, Ana-Maria (Boston), Chen, Dawei (Chestnut Hill), Chiodo, Alessandro (Paris), Darondeau, Lionel (Warszawa), Debarre, Olivier (Paris), Deopurkar, Anand (New York), Ein, Lawrence (Chicago), Eisenbud, David (Berkeley), Erman, Daniel (Madison), Fu, Lie (Villeurbanne), Fulger, A. Mihai (Princeton), Gonzalez-Alonso, Victor (Hannover), Gounelas, Frank (Berlin), Grushevsky, Samuel (Stony Brook), Guéré, Jérémy (Berlin), Hassett, Brendan (Providence), Hering, Milena (Edinburgh), Huybrechts, Daniel (Bonn), Javanpeykar, Ariyan (Mainz), Kebekus, Stefan (Freiburg i. Br.), Kemeny, Michael (Berlin), Laza, Radu (Stony Brook), Lazarsfeld, Robert (Stony Brook), Li, Zhiyuan (Bonn), Macri, Emanuele (Boston), Manivel, Laurent (Marseille), O'Grady, Kieran (Roma), Ou, Wenhao (Bonn), Patel, Anand (Chestnut Hill), Pavlov, Alexander (Toronto), Perrin, Nicolas (Versailles), Perry, Alexander (Cambridge), Petersen, Dan (Copenhagen), Raicu, Claudiu (Notre Dame), Riedl, Eric (Chicago), Schreyer, Frank-Olaf (Saarbrücken), Totaro, Burt (Los Angeles), Tripathy, Arnav (Stanford), Vakil, Ravi (Stanford), van der Geer, Gerard (Amsterdam), Verra, Alessandro (Roma)

19.06. – 25.06.2016 **Hyperbolic Techniques in Modelling, Analysis and Numerics**

Organizers: Rinaldo M. Colombo, Brescia
Philippe G. LeFloch, Paris
Christian Rohde, Stuttgart

Abstract
Several research areas are flourishing on the roots of the breakthroughs in conservation laws that took place in the last two decades. The meeting played a key role in providing contacts among the different branches that are currently developing. All the invitees shared the same common background that consists of the analytical and numerical techniques for nonlinear hyperbolic balance laws. However, their fields of applications and their levels of abstraction are very diverse. The workshop was the unique opportunity to share ideas about analytical issues like the fine-structure of singular solutions or the validity of entropy solution concepts. It turned out that generalized hyperbolic techniques are able to handle the challenges posed by new applications. The design of efficient structure preserving methods turned out to be the major line of development in numerical analysis.

Participants
Amadori, Debora (L'Aquila (AQ)), Benzoni-Gavage, Sylvie (Villeurbanne), Bianchini, Stefano (Trieste), Borsche, Raul (Kaiserslautern), Boutin, Benjamin (Rennes), Bressan, Alberto (University Park), Chalons, Christophe (Versailles), Chertock, Alina (Raleigh), Colombo, Rinaldo M. (Brescia), Corli, Andrea (Ferrara), Crippa, Gianluca (Basel), Daube, Johannes (Freiburg i. Br.), Donadello, Carlotta (Besancon), Garavello, Mauro (Milano), Giesselmann, Jan (Stuttgart), Goatin, Paola (Sophia Antipolis), Godlewski, Edwige (Paris), Guerra, Graziano (Milano), Helluy, Philippe (Strasbourg), Holden, Helge (Trondheim), Klar, Axel (Kaiserslautern), Klingenberg, Christian (Würzburg), Kröner, Dietmar (Freiburg i. Br.), LeFloch, Philippe G. (Paris), Liu, Tai-Ping (Taipei), Luckhaus, Stephan (Leipzig), Lukacova-Medvidova, Maria (Mainz), Marcellini, Francesca (Milano), Modena, Stefano (Leipzig), Müller, Siegfried (Aachen), Nordli, Anders S. (Trondheim), Puppo, Gabriella A. (Como), Risebro, Nils Henrik (Oslo), Rohde, Christian (Stuttgart), Rossi, Elena (Milano), Russo, Giovanni (Catania), Schleper, Veronika (Stuttgart), Shearer, Michael (Raleigh), Tadmor, Eitan (College Park), Thein, Ferdinand (Magdeburg), Torrilhon, Manuel (Aachen), Trivisa, Konstantina (College Park), Tzavaras, Athanasios E. (Thuwal), Warnecke, Gerald (Magdeburg), Weber, Franziska (Zürich), Westdickenberg, Michael (Aachen)

26.06. – 02.07.2016 **Algebraic K-theory and Motivic Cohomology**

Organizers:
Thomas Geisser, Tokyo
Annette Huber-Klawitter, Freiburg
Uwe Jannsen, Regensburg
Marc Levine, Essen

Abstract

Algebraic K-theory and motivic cohomology have developed together over the last thirty years. Both of these theories rely on a mix of algebraic geometry and homotopy theory for their construction and development, and both have had particularly fruitful applications to problems of algebraic geometry, number theory and quadratic forms. The homotopy-theory aspect has been expanded significantly in recent years with the development of motivic homotopy theory and triangulated categories of motives, and K-theory has provided a guiding light for the development of non-homotopy invariant theories. 19 one-hour talks presented a wide range of latest results on many aspects of the theory and its applications.

Participants

Ananyevskiy, Alexey (St. Petersburg), Ancona, Giuseppe (Zürich), Asok, Aravind (Los Angeles), Ausoni, Christian (Villetaneuse), Binda, Federico (Essen), Bräunling, Oliver (Freiburg i. Br.), Bunke, Ulrich (Regensburg), Cortinas, Guillermo (Buenos Aires), Deglise, Frederic (Lyon), Ertl, Veronika (Regensburg), Esnault, Hélène (Berlin), Fasel, Jean (Saint-Martin-d'Heres), Geisser, Thomas (Tokyo), Haesemeyer, Christian (Los Angeles), Harrer, Daniel (Freiburg i. Br.), Hesselholt, Lars (Nagoya), Hornbostel, Jens (Wuppertal), Hoyois, Marc (Cambridge), Ivorra, Florian (Rennes), Jannsen, Uwe (Regensburg), Kahn, Bruno (Paris), Kai, Wataru (Tokyo), Kelly, Shane (Freiburg i. Br.), Kerz, Moritz (Regensburg), Kohrita, Tohru (Nagoya), Levine, Marc (Essen), Lichtenbaum, Stephen (Providence), Merkurjev, Alexander S. (Los Angeles), Morin, Baptiste (Toulouse), Morrow, Matthew (Bonn), Panin, Ivan A. (St. Petersburg), Pepin-Lehalleur, Simon (Berlin), Quick, Gereon (Trondheim), Röndigs, Oliver (Osnabrück), Rosenschon, Andreas (München), Rülling, Kay (Berlin), Sato, Kanetomo (Tokyo), Schlichting, Marco (Coventry), Schmidt, Alexander (Heidelberg), Spitzweck, Markus (Osnabrück), Srinivas, Vasudevan (Mumbai), Sugiyama, Rin (Tokyo), Tabuada, Goncalo (Cambridge), Tamme, Georg (Regensburg), Vial, Charles (Cambridge), Völkel, Konrad (Freiburg i. Br.), Walker, Mark E. (Lincoln), Weibel, Charles A. (New Brunswick), Wendt, Matthias (Hannover), Yamazaki, Takao (Sendai), Zakharevich, Inna (Chicago), Zhao, Yigeng (Regensburg), Zhong, Changlong (Albany)

03.07. – 09.07.2016 **Statistics for Shape and Geometric Features**

Organizers: Dragi Anevski, Lund
Christopher Genovese, Pittsburgh
Geurt Jongbloed, Delft
Wolfgang Polonik, Davis

Abstract

The constant emergence of novel technologies result in novel data generating devices and mechanisms that lead to a prevalence of highly complex data. To analyze such data, novel statistical methodologies need to be developed. This workshop addressed challenges that arise in the theoretical analyses of procedures in which geometry, shape and topology play central roles. The theoretical ideas involved here intersect deeply with a wide variety of fields, including mathematical statistics, probability theory, computational topology, and computational and differential geometry. The workshop brought together scholars with different perspectives, with the goal of facilitating cross-pollination to spur the development of new ideas, new analytical approaches, and new methods in geometric and shape statistics.

Participants

Anevski, Dragi (Lund), Arias-Castro, Ery (La Jolla), Balabdaoui, Fadoua (Paris), Chacón Durán, José Enrique (Mérida), Chatterjee, Sabyasachi (Chicago), Cisewski, Jessi (New Haven), Dette, Holger (Bochum), Dümbgen, Lutz (Bern), Genovese, Christopher (Pittsburgh), Groeneboom, Piet (Delft), Hendrickx, Kim (Diepenbeek), Huckemann, Stephan (Göttingen), Jongbloed, Geurt (Delft), Lopuhaä, Rik (Delft), Mammen, Enno (Heidelberg), Marron, James Stephen (Chapel Hill), Michel, Bertrand (Paris), Munk, Axel (Göttingen), Musta, Eni (Delft), Polonik, Wolfgang (Davis), Samworth, Richard (Cambridge), Schwartzman, Armin (La Jolla), Sen, Bodhisattva (New York), Sommerfeld, Max (Göttingen), Srivastava, Anuj (Tallahassee), Wellner, Jon A. (Seattle)

03.07. – 09.07.2016 **Learning Theory and Approximation**

Organizers: Andreas Christmann, Bayreuth
Kurt Jetter, Stuttgart
Steve Smale, Hong Kong
Ding-Xuan Zhou, Hong Kong

Abstract

The main goal of this workshop has been to blend mathematical results from statistical learning theory and approximation theory to use synergistic effects to work on current research questions. Learning theory aims at modeling unknown function relations and data structures from samples in an automatic manner. Approximation theory is naturally used for the advancement and closely connected to the further development of learning theory, in particular for the exploration of new useful algorithms, and for the theoretical understanding of existing methods. Conversely, the study of learning theory also gives rise to interesting theoretical problems for approximation theory. This workshop has concentrated on the following topics: Pitchfork bifurcation of dynamical systems arising from mathematical foundations of cell development; regularized kernel based learning in the Big Data situation; deep learning; convergence rates of learning and online learning algorithms; numerical refinement algorithms to learning; statistical robustness of regularized kernel based learning.

Participants

Berdysheva, Elena (Gießen), Binev, Peter G. (Columbia), Boucheron, Stephane (Paris), Buhmann, Martin D. (Giessen), Charina, Maria (Wien), Christmann, Andreas (Bayreuth), Gröchenig, Karlheinz (Wien), Guo, Xin (Hong Kong), Jetter, Kurt (Stuttgart), Kügler, Philipp (Stuttgart), Mukherjee, Sayan (Durham), Plonka-Hoch, Gerlind (Göttingen), Poggio, Tomaso (Cambridge), Rauhut, Holger (Aachen), Sauer, Tomas (Passau), Schölkopf, Bernhard (Tübingen), Smale, Steve (Hong Kong), Steidl, Gabriele (Kaiserslautern), Steinwart, Ingo (Stuttgart), Stöckler, Joachim (Dortmund), Suykens, Johan (Leuven), Tsybakov, Alexandre B. (Malakoff), Wendland, Holger (Bayreuth), Xiang, Daohong (Bayreuth), Ying, Yiming (Albany), Zhou, Ding-Xuan (Hong Kong)

10.07. – 16.07.2016 **Calculus of Variations**

Organizers: Simon Brendle, Stanford
Alessio Figalli, Austin
Robert L. Jerrard, Toronto
Neshan Wickramasekera, Cambridge UK

Abstract

The Calculus of Variations is subject with a long and distinguished history, a great deal of diverse current activity, and close connections to other fields such as geometry and mathematical physics. The July 2016 workshop on the Calculus of Variations presented research that resolved longstanding conjectures, shed new light on classical results, pointed toward new research directions, and displayed progress on a range of aspects, classical and otherwise, of the Calculus of Variations.

Participants

Alberti, Giovanni (Pisa), Beck, Lisa (Augsburg), Becker-Kahn, Spencer T. (Cambridge), Begley, Tom (Cambridge), Bellettini, Costante (Cambridge), Brendle, Simon (New York), Brenier, Yann (Palaiseau), Chodosh, Otis (Cambridge), Cinti, Eleonora (Berlin), Colombo, Maria (Zürich), Daneri, Sara (Erlangen), del Pino, Manuel (Santiago), de Philippis, Guido (Trieste), Dolbeault, Jean (Paris), Fernandez-Real, Xavier (Austin), Figalli, Alessio (Zürich), Fusco, Nicola (Napoli), Haslhofer, Robert (Toronto), Hiesmayr, Fritz (Cambridge), Huisken, Gerhard (Tübingen), Hung, Pei-Ken (New York), Ignat, Radu (Toulouse), Jerrard, Robert L. (Toronto), Johne, Florian (Tübingen), Kell, Martin (Tübingen), Krummel, Brian J. (Austin), Lamy, Xavier (Leipzig), Laux, Tim (Leipzig), Lott, John (Berkeley), Luckhaus, Stephan (Leipzig), Maggi, Francesco (Austin), Menne, Ulrich (Golm), Mondino, Andrea (Coventry), Naber, Aaron C. (Evanston), Petrache, Mircea (Paris Cedex), Rivière, Tristan (Zürich), Santambrogio, Filippo (Orsay), Schulze, Felix (London), Smart, Charles K. (Ithaca), Smets, Didier (Paris), Spadaro, Emanuele Nunzio (Leipzig), Spolaor, Luca (Leipzig), Struwe, Michael (Zürich), Terracini, Susanna (Torino), Tonegawa, Yoshihiro (Tokyo), Topping, Peter M. (Coventry), Toro, Tatiana (Seattle), Westdickenberg, Maria G. (Aachen), White, Brian (Stanford), Wickramasekera, Neshan (Cambridge), Young, Robert (New York)

17.07. – 23.07.2016 **Topologie**

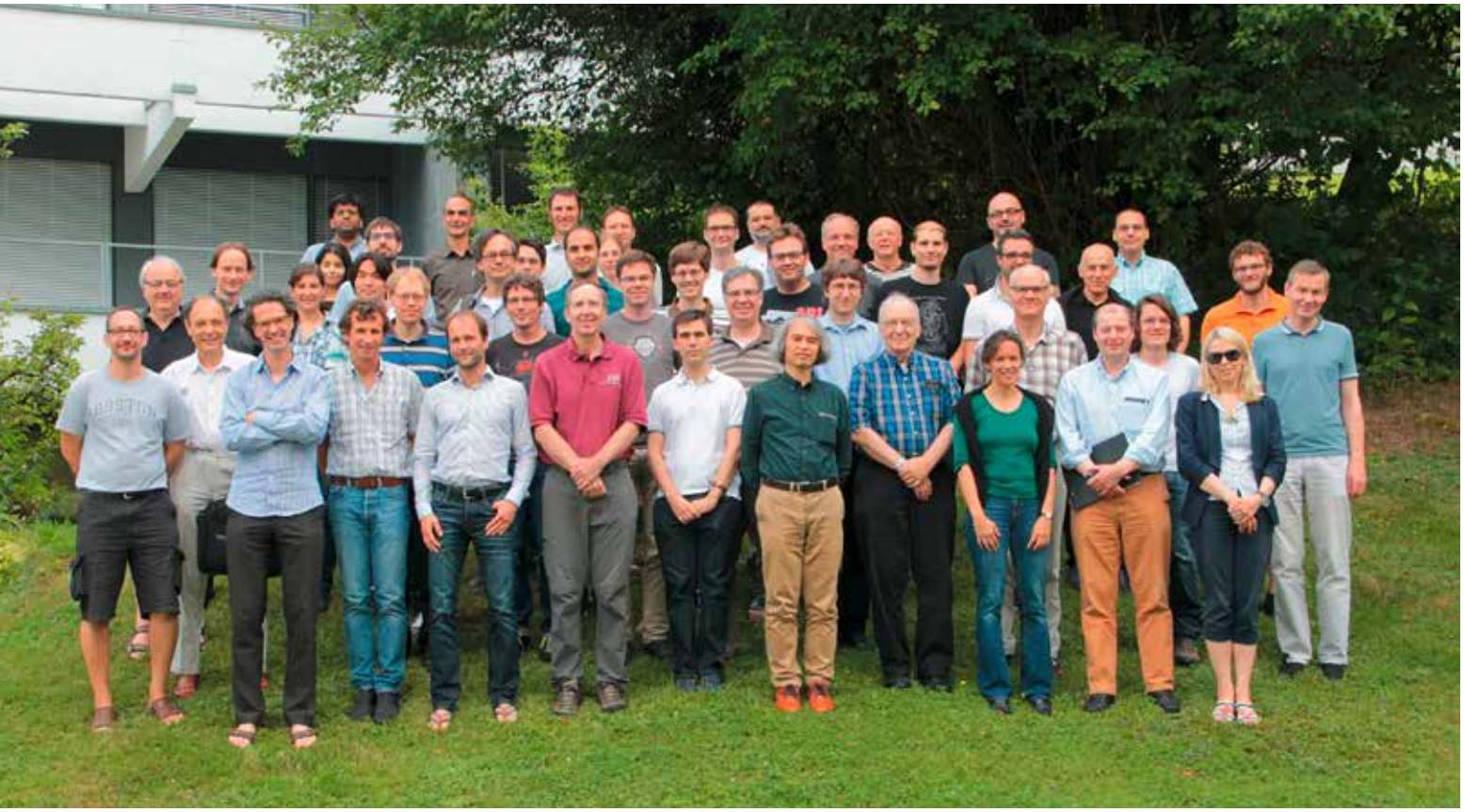
Organizers: Mark Behrens, Notre Dame
Peter Teichner, Bonn
Nathalie Wahl, Copenhagen
Michael Weiss, Münster

Abstract

The Oberwolfach conference "Topologie" is one of only a few opportunities for researchers from many different areas in algebraic and geometric topology to meet and exchange ideas. This year we emphasized two topics of recent interest: representation stability and motivic homotopy theory, with their respective applications to arithmetic, classical homotopy theory as well as algebraic geometry. Double lectures on each topic where given by Benson Farb and Dan Isaksen. The rest of the program spanned a wide range of topics ranging from topological Hochschild homology to obstruction theory of positive scalar curvature, via, to name a few, K–theory of C*–algebras, modular characteristic classes, Goodwillie calculus, 2-Segal spaces and deformation quantization.

Participants

Barthel, Tobias (Bonn), Beaudry, Agnès (Chicago), Behrens, Mark Joseph (Notre Dame), Bergner, Julie (Charlottesville), Bunke, Ulrich (Regensburg), Djament, Aurélien (Nantes), Egas Santander, Daniela (Berlin), Eldred, Rosona (Münster), Farb, Benson (Chicago), Galatius, Soren (Stanford), Gepner, David J. (West Lafayette), Glasman, Saul (Cambridge), Grodal, Jesper (Copenhagen), Haugseng, Rune (Copenhagen), Hausmann, Markus (Bonn), Hebestreit, Fabian (Bonn), Hess, Kathryn (Lausanne), Heuts, Gijs (Copenhagen), Horel, Geoffroy (Bonn), Isaksen, Daniel (Detroit,), Joachim, Michael (Münster), Kitchloo, Nitya (Baltimore), Krause, Achim (Bonn), Kupers, Alexander (Copenhagen), Land, Markus (Bonn), Löh, Clara (Regensburg), Lück, Wolfgang (Bonn), Mathew, Akhil (Cambridge), Meier, Lennart (Bonn), Nariman, Sam (Münster), Nikolaus, Thomas (Bonn), Noel, Justin (Regensburg), Ormsby, Kyle M. (Portland), Ostvaer, Paul Arne (Oslo), Ozornova, Viktoriya (Bonn), Patchkoria, Irakli (Kobenhavn), Randal-Williams, Oscar (Cambridge), Richter, Birgit (Hamburg), Riehl, Emily (Baltimore), Rozenblyum, Nick (Chicago), Scheimbauer, Claudia I. (Bonn), Schwede, Stefan (Bonn), Sprehn, David (Copenhagen), Stapleton, Nat (Bonn), Stojanoska, Vesna (Urbana), Teichner, Peter (Bonn), Wahl, Nathalie (Copenhagen), Wang, Guozhen (Copenhagen), Weiss, Michael (Münster), Westerland, Craig (Minneapolis), Wickelgren, Kirsten G. (Cambridge), Wolfson, Jesse (Chicago), Zeidler, Rudolf (Göttingen)



24.07. – 30.07.2016 **Recent Mathematical Developments in Quantum Field Theory**

Organizers: Abdelmalek Abdesselam, Charlottesville
Stefan Hollands, Leipzig
Christoph Kopper, Palaiseau
Gandalf Lechner, Cardiff

Abstract
Several decades after its invention, quantum field theory (QFT) remains the basis of the theoretical understanding of elementary particle physics, and an important tool in the study of condensed matter systems, making it a topic of prime interests for many physicists. But in view of the rich mathematical structure of QFT, and the many different formulations it allows, QFT is by now also a field of research in mathematics, acting as a bridge for the interchange of ideas, concepts and methods between mathematics and theoretical physics. This workshop has focused on three areas in mathematical quantum field theory and their interrelations: 1) conformal field theory, 2) constructions of interacting models of quantum field theory by various methods, and 3) several approaches studying the interplay of quantum field theory and gravity.

Participants
Abdesselam, Abdelmalek (Charlottesville), Alazzawi, Sabina (Garching), Bahns, Dorothea (Göttingen), Bär, Christian (Potsdam), Bischoff, Marcel (Nashville), Bostelmann, Henning (Heslington, York), Brown, Matthew (Santa Barbara), Brunetti, Romeo (Povo), Cadamuro, Daniela (Göttingen), Carpi, Sebastiano (Pescara), Chandra, Ajay (Coventry), Dappiaggi, Claudio (Pavia), Dybalski, Wojciech (Garching), Efremov, Alexander (Palaiseau), Fewster, Christopher (Heslington, York), Fröb, Markus B. (Heslington, York), Gottschalk, Hanno (Wuppertal), Granet, Etienne (Palaiseau), Grosse, Harald (Wien), Guida, Riccardo (Gif-sur-Yvette), Hack, Thomas-Paul (Leipzig), Hilger, Susanne (Bonn), Hollands, Stefan (Leipzig), Imbrie, John (Charlottesville), Jaekel, Christian D. (Sao Paulo), Jauslin, Ian (Roma), Kawahigashi, Yasuyuki (Tokyo), Knörrer, Horst (Zürich), Kopper, Christoph (Palaiseau), Lechner, Gandalf (Cardiff), Lohmann, Martin (Bonn), Pinamonti, Nicola (Genova), Rejzner, Kasia (Heslington, York), Rivasseau, Vincent (Orsay), Salmhofer, Manfred (Heidelberg), Samberg, Andreas (Heidelberg), Sanders, Ko (Leipzig), Schomerus, Volker (Hamburg), Stephan, Christoph (Potsdam), Stoica, Bogdan (Pasadena), Strohmaier, Alexander (Loughborough), Tanimoto, Yoh (Roma), Taslimitehrani, Mojtaba (Leipzig), Teschner, Jörg (Hamburg), Verch, Rainer (Leipzig), Wald, Robert (Chicago), Wulkenhaar, Raimar (Münster), Zahn, Jochen (Leipzig)

31.07. – 06.08.2016 **Computational Group Theory**

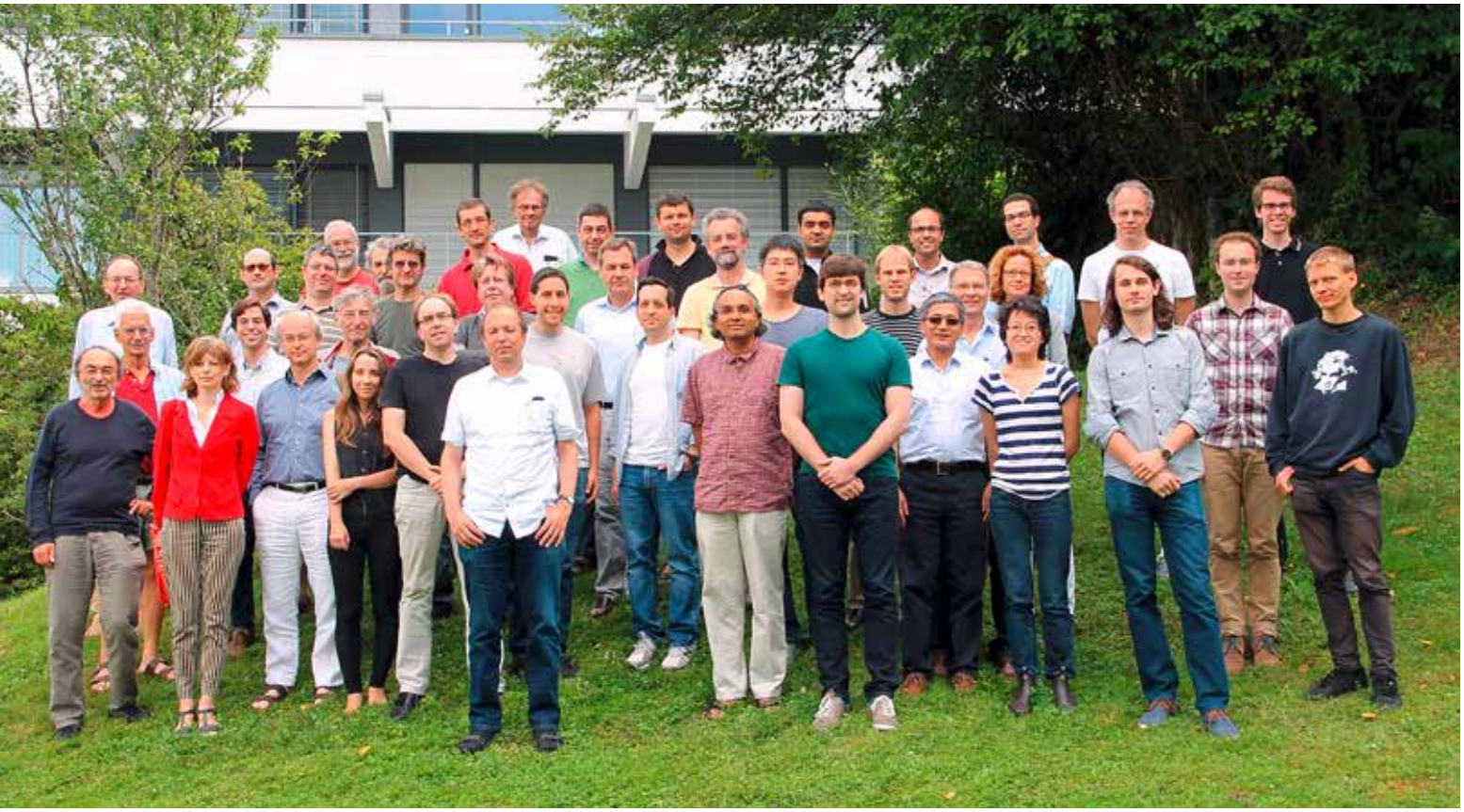
Organizers: Bettina Eick, Braunschweig
Gerhard Hiß, Aachen
Derek Holt, Coventry
Eamonn O'Brien, Auckland

Abstract

This was the seventh workshop on Computational Group Theory. It showed that Computational Group Theory has significantly expanded its range of activities. For example, symbolic computations with groups and their representations and computations with infinite groups play a major role nowadays. The talks also presented connections and applications to cryptography, number theory and the algorithmic theory of algebras.

Participants

Bartholdi, Laurent (Göttingen), Bray, John N. (London), Brooksbank, Peter A. (Lewisburg), Cannon, John J. (Sydney), De Franceschi, Giovanni (Auckland), de Graaf, Willem A. (Povo), Detinko, Alla (St. Andrews), Dietrich, Heiko (Clayton), Eick, Bettina (Braunschweig), Ellis, Graham (Galway), Fieker, Claus (Kaiserslautern), Flannery, Dane (Galway), Geck, Meinolf (Stuttgart), Green, David J. (Jena), Guglielmetti, Rafael (Fribourg), Havas, George (Queensland), Hiß, Gerhard (Aachen), Holt, Derek F. (Coventry), Horn, Max (Gießen), Hulpke, Alexander (Fort Collins), Kantor, William M. (Brookline), King, Simon A. (Köln), Kreuzer, Martin (Passau), Leedham-Green, Charles R. (London), Liebeck, Martin W. (London), Linton, Steve (St. Andrews), Lübeck, Frank (Aachen), Lux, Klaus (Tucson), Magaard, Kay (Birmingham), Maglione, Josh (Fort Collins), Malle, Gunter (Kaiserslautern), Moede, Tobias (Braunschweig), Müller, Jürgen (Jena), Myasnikov, Alexei G. (Hoboken), Nebe, Gabriele (Aachen), Niemeyer, Alice (Aachen), O'Brien, Eamonn A. (Auckland), Pfeiffer, Götz (Galway), Praeger, Cheryl E. (Crawley), Röhrle, Gerhard (Bochum), Roney-Dougal, Colva M. (St. Andrews), Rossmann, Tobias (Bielefeld), Ryba, Alexander (Flushing), Savchuk, Dmytro (Tampa), Schneider, Csaba (Belo Horizonte), Shpectorov, Sergey V. (Birmingham), Shpilrain, Vladimir (New York), Soicher, Leonard H. (London), Unger, William R. (Sydney), Vaughan-Lee, Michael R. (Oxford), Voll, Christopher (Bielefeld), Wilson, James B. (Fort Collins), Wilson, Robert A. (London)



07.08. – 13.08.2016 **Arithmetic Geometry**

Organizers: Gerd Faltings, Bonn
Johan de Jong, New York
Peter Scholze, Bonn

Abstract

Arithmetic geometry is at the interface between algebraic geometry and number theory, and studies schemes over the ring of integers of number fields, or their p-adic completions. The workshop was well attended by over 50 participants from various backgrounds and covered a wide range of topics in algebraic geometry and number theory. An emphasis of the workshop was on p-adic techniques, but various other aspects including Hodge theory, Arakelov theory and global questions were discussed.

Participants

Andre, Yves (Paris), Andreatta, Fabrizio (Milano), Bhatt, Bhargav (Ann Arbor), Burgos Gil, José Ignacio (Madrid), Caraiani, Ana (Princeton), Colmez, Pierre (Paris), Conrad, Brian (Stanford), de Jong, Johan (New York), Edixhoven, Bas (Leiden), Faltings, Gerd (Bonn), Fontaine, Jean-Marc (Orsay), Gabber, Ofer (Bures-sur-Yvette), Hansen, David (New York), Harder, Günter (Bonn), Herzig, Florian (Toronto), Hesselholt, Lars (Nagoya), Iovita, Adrian (Montreal), Jannsen, Uwe (Regensburg), Katz, Nicholas M. (Princeton), Kedlaya, Kiran S. (La Jolla), Kisin, Mark (Cambridge), Klingler, Bruno (Paris), Kramer, Jürg (Berlin), Lieblich, Max (Seattle), Liedtke, Christian (Garching bei München), Litt, Daniel (New York), Liu, Ruochuan (Beijing), Madapusi Pera, Keerthi (Chicago), Mihatsch, Andreas (Bonn), Morel, Sophie (Princeton), Niziol, Wieslawa (Lyon), Obus, Andrew S. (Charlottesville), Olsson, Martin (Berkeley), Paskunas, Vytautas (Essen), Rössler, Damian (Toulouse), Schneider, Peter (Münster), Scholze, Peter (Bonn), She, Yiwei (New York), van Dobben de Bruyn, Remy (New York), Varshavsky, Yakov (Jerusalem), von Kaenel, Rafael (Princeton), Werner, Annette (Frankfurt am Main), Wilms, Robert (Mainz), Wintenberger, Jean-Pierre (Strasbourg Cedex), Zhang, Shouwu (Princeton)

14.08. – 20.08.2016 **Multiscale Interactions in Geophysical Fluids**

Organizers: Rupert Klein, Berlin
Shafer Smith, New York
Jacques Vanneste, Edinburgh

Abstract

The dynamics of the atmosphere and ocean involves a broad range of spatial and temporal scales, many of which emerge through complex nonlinear mechanisms from forcings at very different scales. This poses major challenges for the numerical prediction of the weather, ocean state and climate: many processes have scales that are too small to be resolved yet they play an essential role in determining large-scale features. This workshop examined how modern mathematical methods – ranging from multiscale asymptotics to adaptive numerical methods and stochastic modelling – can be applied to represent the large-scale impact of these small-scale processes and improve both deterministic and probabilistic predictions.

Participants

Achatz, Ulrich (Frankfurt am Main), Badin, Gualtiero (Hamburg), Bouchet, Freddy (Lyon), Brenier, Yann (Palaiseau), Bresch, Didier (Le Bourget du Lac), Bühler, Oliver (New York), Cessi, Paola (La Jolla), Chumakova, Lyuba G. (Edinburgh), Cullen, Mike (Exeter), Doering, Charles R. (Ann Arbor), Frank, Jason (Utrecht), Geurts, Bernard (Enschede), Gottwald, Georg A. (Sydney), Grooms, Ian (Boulder), Haynes, Peter H. (Cambridge), Hittmeir, Sabine (Wien), Holm, Darryl D. (London), Holmes-Cerfon, Miranda (New York), Horenko, Illia (Lugano), Julien, Keith (Boulder), Klein, Rupert (Berlin), Korn, Peter (Hamburg), Kuksin, Sergei B. (Palaiseau), Maddison, James R. (Edinburgh), Muller, Caroline (Palaiseau), Nikurashin, Maxim (Hobart Tas), Oliver, Marcel (Bremen), Paparella, Francesco (Lecce), Pauluis, Olivier (New York), Schlutow, Mark (Berlin), Smith, Shafer (New York), Smolarkiewicz, Piotr (Reading), Stechmann, Samuel N. (Madison), Thomas, Jim (New York), Titi, Edriss S. (Rehovot), Tzella, Alexandra (Birmingham), Vallis, Geoffrey K. (Exeter), Vanneste, Jacques (Edinburgh), Vercauteren, Nikki (Berlin), Wang, Xiaoming (Tallahassee), Wingate, Beth (Exeter), Xie, Jin-Han (Berkeley), Young, William R. (La Jolla), Zanna, Laure (Oxford), Zeitlin, Vladimir (Paris)

21.08. – 27.08.2016 **C*-Algebras**

Organizers: Mikael Rordam, Copenhagen
Andreas Thom, Dresden
Stefaan Vaes, Leuven
Dan-Virgil Voiculescu, Berkeley

Abstract

The field of operator algebras is a flourishing area of mathematics with strong ties to many other areas including functional/harmonic analysis, topology, (non-commutative) geometry, group theory and dynamical systems. The C*-Algebra workshop at Oberwolfach brings together leading experts and young researchers in all subjects where C*-algebras play a major role. The main goal of this meeting is to foster contacts and collaborations between researchers from different directions, as well as to highlight the main developments in the field.

Participants

Alekseev, Vadim (Dresden), Anantharaman-Delaroche, Claire (Orleans), Ando, Hiroshi (Chiba), Bisch, Dietmar (Nashville), Boutonnet, Rémi (Talence), Carderi, Alessandro (Dresden), Dabrowski, Yoann (Villeurbanne), Dadarlat, Marius (West Lafayette), De Chiffre, Marcus (Dresden), de Laat, Tim (Leuven), de la Salle, Mikael (Lyon), Dowerk, Philip (Leuven), Dykema, Ken (College Station), Echterhoff, Siegfried (Münster), Eilers, Soren (Copenhagen), Elliott, George A. (Toronto), Farah, Ilijas (Toronto), Giordano, Thierry (Ottawa, Ontario), Hayes, Benjamin (Nashville), Hirshberg, Ilan (Beer Sheva), Houdayer, Cyril (Orsay), Kennedy, Matthew (Waterloo), Kerr, David (College Station), Larsen, Nadia Slavila (Oslo), Li, Xin (London), Lin, Huaxin (Eugene), Matsuzawa, Yasumichi (Nagano), Musat, Magdalena E. (Copenhagen), Nelson, Brent (Berkeley), Phillips, N. Christopher (Eugene), Popa, Sorin (Los Angeles), Raum, Sven (Münster), Rordam, Mikael (Kobenhavn), Sato, Yasuhiko (Kyoto), Scarparo, Eduardo Paiva (Kobenhavn), Shlyakhtenko, Dimitri (Los Angeles), Skoufranis, Paul D. (Toronto, Ontario), Strung, Karen (Warszawa), Szabo, Gabor (Münster), Thiel, Hannes (Münster), Thom, Andreas B. (Dresden), Tikuisis, Aaron (Aberdeen), Vaes, Stefaan (Leuven), Valette, Alain (Neuchatel), Verraedt, Peter (Leuven), White, Stuart (Glasgow), Willett, Rufus E. (Honolulu), Winter, Wilhelm (Münster), Yamashita, Makoto (Tokyo)

28.08. – 03.09.2016 **Measured Group Theory**

Organizers: Miklos Abert, Budapest
Damien Gaboriau, Lyon
Andreas Thom, Dresden

Abstract

The workshop aimed to study discrete and Lie groups and their actions using measure theoretic methods and their asymptotic invariants, such as ℓ^2-invariants, the rank gradient, cost, torsion growth, entropy-type invariants and invariants coming from random walks and percolation theory. The participants came from a wide range of mathematics: asymptotic group theory, geometric group theory, ergodic theory, ℓ^2-theory, graph convergence, representation theory, probability theory, descriptive set theory and algebraic topology.

Participants

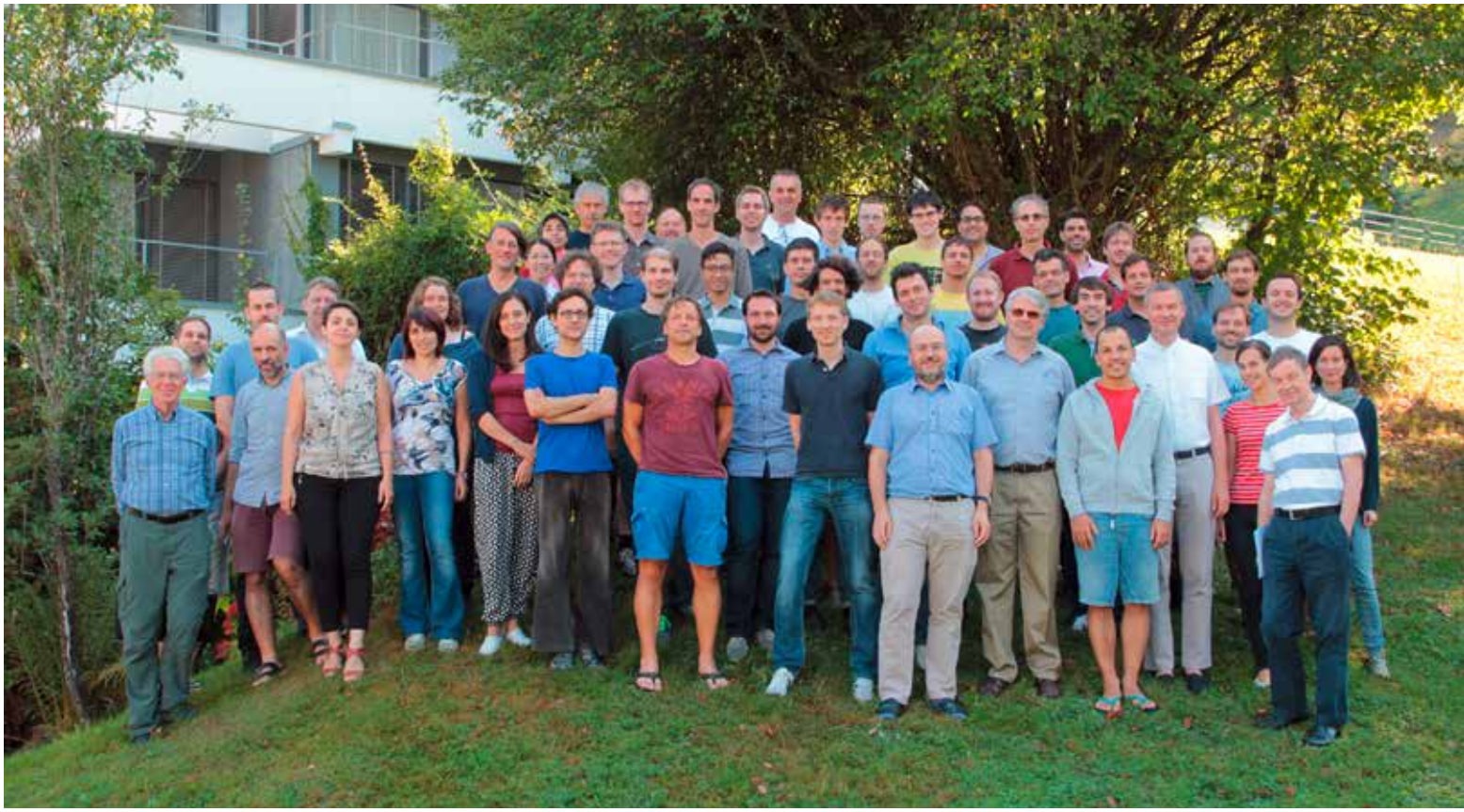
Abert, Miklos (Budapest), Alekseev, Vadim (Dresden), Bader, Uri (Haifa), Bekka, Bachir (Rennes), Breuillard, Emmanuel (Münster), Carderi, Alessandro (Dresden), Conley, Clinton (Pittsburgh), Elek, Gabor (Lancaster), Elkasapy, Abdelrhman (Leipzig), Ershov, Mikhail (Charlottesville), Fraczyk, Mikolaj (Orsay), Furman, Alex (Chicago), Gaboriau, Damien (Lyon), Gamm, Christoph (Leipzig), Glasner, Yair (Beer Sheva), Grabowski, Lukasz (Coventry), Hayes, Benjamin (Nashville), Jacoboni, Lison (Orsay), Jaikin-Zapirain, Andrei (Madrid), Knudby, Søren (Münster), Kozma, Gady (Rehovot), Kun, Gabor (Budapest), Le Boudec, Adrien (Louvain-La-Neuve), Le Maitre, Francois (Louvain-La-Neuve), Lück, Wolfgang (Bonn), Marks, Andrew (Los Angeles), Matte Bon, Nicolas (Paris), Mellick, Samuel (Budapest), Meszaros, Andras (Budapest), Nikolov, Nikolay (Oxford), Osajda, Damian L. (Wroclaw), Pikhurko, Oleg (Coventry), Pogorzelski, Felix (Haifa), Sauer, Roman (Karlsruhe), Schick, Thomas (Göttingen), Schlage-Puchta, Jan-Christoph (Rostock), Schneider, Jakob (Dresden), Schneider, Martin (Dresden), Seward, Brandon (New York), Shusterman, Mark (Ramat Aviv, Tel Aviv), Szegedy, Balazs (Budapest), Szöke, Nóra Gabriella (Lausanne), Tent, Katrin (Münster), Terpai, Tamas (Budapest), Thom, Andreas B. (Dresden), Thomas, Simon (Piscataway), Timar, Adam (Budapest), Tóth, László Márton (Budapest), Tsankov, Todor (Paris), Tserunyan, Anush (Urbana), Tucker-Drob, Robin (Piscataway)

04.09. – 10.09.2016 **Self-Adaptive Numerical Methods for Computationally Challenging Problems**

Organizers: Randy Bank, La Jolla
Zhiqiang Cai, West Lafayette
Rüdiger Verfürth, Bochum

Abstract
Self-adaptive numerical methods provide a powerful and automatic approach in scientific computing. In particular, Adaptive Mesh Refinement (AMR) algorithms have been widely used in computational science and engineering and have become a necessary tool in computer simulations of complex natural and engineering problems. The key ingredient for success of self-adaptive numerical methods is a posteriori error estimates that are able to accurately locate sources of global and local error in the current approximation. The workshop creates a forum for junior and senior researchers in numerical analysis and computational science and engineering to discuss recent advances, initiates future research projects, and establishes new collaborations on convergence theory of adaptive numerical methods and on the construction and analysis of efficient, reliable, and robust a posteriori error estimators for computationally challenging problems.

Participants
Bangerth, Wolfgang (Fort Collins), Bank, Randolph E. (La Jolla), Bänsch, Eberhard (Erlangen), Bertrand, Fleurianne (Essen), Braess, Dietrich (Bochum), Brannick, James (University Park), Brenner, Susanne C. (Baton Rouge), Cai, Difeng (West Lafayette), Cai, Zhiqiang (West Lafayette), Carstensen, Carsten (Berlin), Demlow, Alan (College Station), Deotte, Chris (La Jolla), Diening, Lars (Osnabrück), Dörfler, Willy (Karlsruhe), Falgout, Robert D. (Livermore), Friedhoff, Stephanie (Köln), Gallistl, Dietmar (Karlsruhe), Gedicke, Joscha (Wien), Grubisic, Luka (Zagreb), Hackbusch, Wolfgang (Leipzig), Hiptmair, Ralf (Zürich), Hu, Jun (Beijing), Kolev, Tzanio V. (Livermore), Kornhuber, Ralf (Berlin), Kreuzer, Christian (Bochum), Ku, JaEun (Stillwater), Langer, Ulrich (Linz), Nochetto, Ricardo H. (College Park), Ohlberger, Mario (Münster), Ovall, Jeffrey S. (Portland), Pollock, Sara (Dayton), Reusken, Arnold (Aachen), Scharle, Toni (Osnabrück), Schedensack, Mira (Bonn), Schmidt, Alfred (Bremen), Starke, Gerhard (Essen), Stevenson, Rob (Amsterdam), Szypowski, Ryan (Pomona), Tantardini, Francesca (Bochum), Vassilevski, Panayot S. (Portland), Vejchodsky, Tomas (Praha), Verfürth, Rüdiger (Bochum), Wheeler, Mary Fanett (Austin), Wittum, Gabriel (Frankfurt am Main), Wollner, Winnifried (Darmstadt), Wu, Xiao-Hui (Spring), Yserentant, Harry (Berlin), Zhang, Shun (HONG KONG), Zhang, Zhimin (Beijing), Zikatanov, Ludmil (University Park)



11.09. – 17.09.2016 **Many-Body Quantum Systems and Effective Theories**

Organizers: Christian Hainzl, Tübingen
Benjamin Schlein, Zürich
Robert Seiringer, Klosterneuburg

Abstract

In the last years, substantial progress has been made in many areas of mathematical physics. The goal of this workshop was to bring together researchers working on analytic and probabilistic aspects of many-body quantum systems and quantum statistical mechanics, to discuss recent developments, exchange ideas and propose new challenges and research directions. Among the questions addressed during the workshop were the derivation of effective equations, the analysis of physically interesting nonlinear partial differential equations emerging from microscopic theories, the study of open quantum systems in and out of equilibrium, and the investigation of the ground state properties and of the dynamics of quantum spin systems.

Participants

Bachmann, Sven (München), Benedikter, Niels (Copenhagen), Boccato, Chiara (Zürich), Brennecke, Christian (Zürich), Cenatiempo, Serena (Zürich), Derezinski, Jan (Warszawa), de Roeck, Wojciech (Leuven), Deuchert, Andreas (Tübingen), Finster, Felix (Regensburg), Fournais, Soren (Aarhus), Frank, Rupert L. (Pasadena), Geisinger, Alissa (Tübingen), Graf, Gian Michele (Zürich), Griesemer, Marcel (Stuttgart), Hainzl, Christian (Tübingen), Hamza, Eman (Cairo), Hasler, David (Jena), Jauslin, Ian (Zürich), Lampart, Jonas (Paris), Langmann, Edwin (Stockholm), Lemm, Marius (Pasadena), Lenzmann, Enno (Basel), Lewin, Mathieu (Paris), Lundholm, Douglas (Stockholm), Mayer, Simon (Klosterneuburg), Merkli, Marco (St. John's), Moser, Thomas (Klosterneuburg), Müller, Peter (München), Nachtergaele, Bruno (Davis), Napiorkowski, Marcin (Klosterneuburg), Ogata, Yoshiko (Tokyo), Ostergaard Sorensen, Thomas (München), Panati, Annalisa (La Garde), Phan Thanh, Nam (Klosterneuburg), Pickl, Peter (München), Porta, Marcello (Zürich), Rademacher, Simone (Zürich), Reuvers, Robin (Copenhagen), Rougerie, Nicolas (Grenoble), Sabin, Julien (Orsay), Saffirio, Chiara (Zürich), Salmhofer, Manfred (Heidelberg), Schach Moeller, Jacob (Aarhus), Schlein, Benjamin (Zürich), Seiringer, Robert (Klosterneuburg), Siedentop, Heinz (München), Sigal, Michael (Toronto), Solovej, Jan Philip (Kobenhavn), Spohn, Herbert (Garching), Teufel, Stefan (Tübingen), Tzaneteas, Tim (Tübingen), Ueltschi, Daniel (Coventry), Yngvason, Jakob (Wien)

18.09. – 24.09.2016 **Adaptive Algorithms**
Organizers: Carsten Carstensen, Berlin
Rob Stevenson, Amsterdam

Abstract
Overwhelming empirical evidence in computational science and engineering proved that self-adaptive mesh-generation is a must-do in reallife problem computational partial differential equations. The mathematical understanding of corresponding algorithms concerns the overlap of two traditional mathematical disciplines, numerical analysis and approximation theory, with computational sciences. The half workshop was devoted to the mathematics of optimal convergence rates and instance optimality of the Dörfler marking or the maximum strategy in various versions of space discretisations and time-evolution problems with all kind of applications in the efficient numerical treatment of partial differential equations.

Participants
Binev, Peter G. (Columbia), Cai, Zhiqiang (West Lafayette), Canuto, Claudio (Torino), Carstensen, Carsten (Berlin), Dahmen, Wolfgang (Aachen), Demlow, Alan (College Station), Diening, Lars (Osnabrück), Feischl, Michael (Sydney), Gallistl, Dietmar (Karlsruhe), Gedicke, Joscha (Wien), Georgoulis, Emmanuil (Athens), Hellwig, Friederike (Berlin), Hu, Jun (Beijing), Lakkis, Omar (Brighton), Melenk, Jens M. (Wien), Nataraj, Neela (Powai, Mumbai), Nicaise, Serge (Valenciennes), Peterseim, Daniel (Bonn), Praetorius, Dirk (Wien), Rabus, Hella (Berlin), Schedensack, Mira (Bonn), Stevenson, Rob (Amsterdam), Tsogtgerel, Gantumur (Montreal), van der Zee, Kris G. (Nottingham), Verani, Marco (Milano), Vohralik, Martin (Le Chesnay)

18.09. – 24.09.2016 **Theory and Numerics of Inverse Scattering Problems**

Organizers: Fioralba Cakoni, Piscataway
Martin Hanke-Bourgeois, Mainz
Andreas Kirsch, Karlsruhe
William Rundell, College Station

Abstract

This workshop addressed specific inverse problems for the timeharmonic Maxwell's equations, resp. special cases of these, such as the Helmholtz equation or quasistatic approximations like in impedance tomography. The inverse problems considered include the reconstruction of obstacles and/or their material properties in a known background, given various kinds of data, such as near or far field measurements in the scattering context and boundary measurements in the quasistatic case.

Participants

Arens, Tilo (Karlsruhe), Borcea, Liliana (Ann Arbor), Cakoni, Fioralba (Piscataway), Colton, David L. (Newark), Eckhardt, Julian (Göttingen), Griesmaier, Roland (Würzburg), Haddar, Houssem (Palaiseau), Hanke-Bourgeois, Martin (Mainz), Harris, Isaac (College Station), Hohage, Thorsten (Göttingen), Hu, Guanghui (Berlin), Hyvoenen, Nuutti (Aalto), Kirsch, Andreas (Karlsruhe), Kress, Rainer (Göttingen), Lechleiter, Armin (Bremen), Liu, Xiaodong (Beijing), Monk, Peter (Newark), Moskow, Shari (Philadelphia), Ott, Julian (Karlsruhe), Rundell, William (College Station), Scherzer, Otmar (Wien), Selgas, Virginia (Gijon), Siltanen, Samuli (University of Helsinki), Sylvester, John (Seattle), von Harrach, Bastian (Frankfurt), Zou, Jun (Hong Kong)

25.09. – 01.10.2016 **Singularities**

Organizers: Francois Loeser, Paris
András Némethi, Budapest
Duco van Straten, Mainz

Abstract

Singularity theory is a central part of contemporary mathematics. It is concerned with the local and global structure of maps and spaces that occur in algebraic, analytic or differential geometric context. For its study it uses methods from algebra, topology, algebraic geometry and complex analysis. The workshop was attended by 54 participants: a very diverse group representing a broad spectrum of interests, age and geographical origin.

Participants

A'Campo, Norbert (Basel), Azam, Haniya (Lahore), Batyrev, Victor V. (Tübingen), Blickle, Manuel (Mainz), Buchweitz, Ragnar-Olaf (Toronto), Budur, Nero (Leuven), Bugden, Mark (Canberra), Burban, Igor (Köln), Comte, Georges (Le Bourget du Lac), D'Alesio Souto, Sofia Nerina (Buenos Aires), de Bobadilla de Olazabal, Javier F. (Bilbao), Dimca, Alexandru (Nice), Ebeling, Wolfgang (Hannover), Faber, Eleonore (Ann Arbor), Garay, Mauricio D. (Bures-sur-Yvette), Goryunov, Victor (Liverpool), Göttsche, Lothar (Trieste), Greuel, Gert-Martin (Kaiserslautern), Gusein-Zade, Sabir M. (Moscow), Hauser, Herwig (Wien), Hertling, Claus (Mannheim), Kerner, Dmitry (Beer-Sheva), Klymchuk, Tetiana (Kiev), Lehn, Manfred (Mainz), Lemahieu, Ann (Nice), Loeser, Francois (Paris), Lüdtke, Martin (Frankfurt), Luengo, Ignacio (Madrid), Mond, David (Coventry), Nagy, Janos (Budapest), Namikawa, Yoshinori (Kyoto), Némethi, András (Budapest), Neumann, Walter David (New York), Nguyen, Hong Duc (Hamburg), Okuma, Tomohiro (Yamagata), Pe Pereira, Maria (Madrid), Pichon, Anne (Marseille), Popescu-Pampu, Patrick (Villeneuve d'Ascq.), Raibaut, Michel (Le Bourget du Lac), Rasmussen, Jacob A. (Cambridge), Rasmussen, Sarah (Cambridge), Reguera, Ana J. (Valladolid), Saito, Kyoji (Chiba), Saito, Morihiko (Kyoto), Sebag, Julien (Rennes), Sigurdsson, Baldur (Bilbao), Stevens, Jan (Göteborg), Takahashi, Atsushi (Osaka), Tamas, Laszlo (Budapest), Thuong, Le Quy (Hanoi), Tibar, Mihai (Villeneuve d'Ascq.), van Straten, Duco (Mainz), Veys, Wim (Leuven), Wahl, Jonathan M. (Chapel Hill)

02.10. – 08.10.2016 **Mathematical and Algorithmic Aspects of Data Assimilation in the Geosciences**

Organizers: Andreas Griewank, Berlin
Sebastian Reich, Potsdam
Ian Roulstone, Guildford
Andrew Stuart, Coventry

Abstract
The field of "Data Assimilation" has been driven by applications from the geosciences where complex mathematical models are interfaced with observational data in order to improve model forecasts. Mathematically, data assimilation is closely related to filtering and smoothing on the one hand and inverse problems and statistical inference on the other. Key challenges of data assimilation arise from the high-dimensionality of the underlying models, combined with systematic spatio-temporal model errors, pure model uncertainty quantification and relatively sparse observation networks. Advances in the field of data assimilation will require combination of a broad range of mathematical techniques from differential equations, statistics, machine learning, probability, scientific computing and mathematical modeling, together with insights from practitioners in the field. The workshop brought together a collection of scientists representing this broad spectrum of research strands.

Participants
Abarbanel, Henry (La Jolla), Acevedo, Walter (Potsdam), Apte, Amit (Bangalore), Bauernschubert, Elisabeth (Offenbach), Bocquet, Marc (Marne-la-Vallée), Bröcker, Jochen (Reading), Bunse-Gerstner, Angelika (Bremen), Carrassi, Alberto (Bergen), Cotter, Colin (London), Crisan, Dan (London), David, Angwenyi (Potsdam), de Wiljes, Jana (Potsdam), Frank, Jason (Utrecht), Gottwald, Georg A. (Sydney), Gratton, Serge (Toulouse), Griewank, Andreas (San Miguel de Urcuquí), Harlim, John (University Park), Hastermann, Gottfried (Berlin), Horenko, Illia (Lugano), Janjic-Pfander, Tijana (München), Kantas, Nicolas (London), Klein, Rupert (Berlin), Korn, Peter (Hamburg), Künsch, Hans Rudolf (Zürich), Law, Kody J.H. (Oak Ridge), Leövey, Hernan (Berlin), Maclean, John (Chapel Hill), Marzouk, Youssef M. (Cambridge), Morzfeld, Matthias (Tucson), Nerger, Lars (Bremerhaven), Nichols, Nancy (Reading), Oliver, Dean (Bergen), Opper, Manfred (Berlin), Potthast, Roland (Offenbach), Reich, Sebastian (Potsdam), Reinhardt, Maria (Potsdam), Robert, Sylvain (Zürich), Roulstone, Ian (Surrey), Ruckstuhl, Yvonne (München), Santitissadeekorn, Naratip (Guildford), Sanz-Alonso, Daniel (Providence), Schillings, Claudia (Coventry), Snyder, Chris (Boulder), Spantini, Alessio (Cambridge), Stannat, Wilhelm (Berlin), Talagrand, Olivier (Paris), Titi, Edriss S. (Rehovot), Toint, Philippe L. (Namur), Tong, Xin (Singapore), van Leeuwen, Peter Jan (Reading)

23.10. – 29.10.2016 **Definability and Decidability Problems in Number Theory**

Organizers: Jochen Koenigsmann, Oxford
Hector Pasten, Cambridge MA
Alexandra Shlapentokh, Greenville
Xavier Vidaux, Concepción

Abstract

This highly interdisciplinary workshop brought together 51 Mathematicians from Number Theory, Logic, Algebraic Geometry, Computability, Model Theory, Arithmetic of Fields, Valuation Theory, and some other related areas. Many contributions and discussions were inspired and driven by the big open decidability questions such as Hilbert's Tenth Problem over Q, the decidability of the first-order theory of $F_p((t))$ or of $\mathbb{C}(t)$, variations of Büchi's Problem and other weak forms of arithmetic, as well as associated questions of definability and logical complexity in various rings of number theoretic interest, and in analogous rings of functions.

Participants

Anscombe, Sylvy (Preston), Chatzidakis, Zoe (Paris), Chompitaki, Dimitra (Heraklion), Cluckers, Raf (Villeneuve d'Ascq.), Colliot-Thelene, Jean-Louis (Orsay), D'Aquino, Paola (Caserta), Demeyer, Jeroen (Gent), Derakhshan, Jamshid (Oxford), Dittmann, Philip (Oxford), Eisentraeger, Kirsten (University Park), Eterovic, Sebastian (Oxford), Fehm, Arno (Konstanz), Freund, Anton (Leeds), Fukuzaki, Kenji (Kagoshima), Gabber, Ofer (Bures-sur-Yvette), Garcia-Fritz, Natalia (Toronto), Geyer, Wulf-Dieter (Erlangen), Györy, Kalman (Debrecen), Hall, Chris (Laramie), Jarden, Moshe (Tel Aviv), Kaplan, Itay (Jerusalem), Koenigsmann, Jochen (Oxford), Kuhlmann, Franz-Viktor (Katowice), MacIntyre, Angus John (London), Miller, Russell (Flushing), Moret-Bailly, Laurent (Rennes), Morrison, Travis (University Park), Nguyen, Kien Huu (Villeneuve d'Ascq.), Park, Jennifer (Ann Arbor), Pasten, Hector V. (Cambridge), Pheidas, Thanases (Heraklion), Point, Francoise (Mons), Pop, Florian (Philadelphia), Prestel, Alexander (Konstanz), Prunescu, Mihai (Bucharest), Razon, Aharon (Beer Sheva), Rigler, Benjamin (Oxford), Scanlon, Thomas W. (Berkeley), Shlapentokh, Alexandra (Greenville), Sirokofskich, Alla (Heraklion), Skorobogatov, Alexei N. (London), Terzo, Giuseppina (Caserta), Thanagopal, Kesavan (Oxford), Utreras, Javier (Concepcion), van den Dries, Lou (Urbana), van Geel, Jan (Gent), Vidaux, Xavier (Concepcion), Videla, Carlos R. (Calgary), Vsemirnov, Maxim (St. Petersburg), Widmer, Martin (Surrey)

06.11. – 12.11.2016 **Analytic Number Theory**

Organizers: Jörg Brüdern, Göttingen
Hugh L. Montgomery, Ann Arbor
Robert C. Vaughan, State College
Trevor D. Wooley, Bristol

Abstract

Analytic number theory is on the roll for quite some time now, with spectacular discoveries year after year. This workshop brought together world leaders and young talent to discuss developments in various branches of the subject. We tried to keep the schedule moderate, with ample time for work and discussion after lunch and in the evening. The programme included a round table discussion on recent advances with the circle method on Tuesday evening, and a problem session on Thursday evening. Many important results have been announced during the week.

Participants

Blomer, Valentin (Göttingen), Bloom, Thomas (Bristol), Bondarenko, Andriy V. (Trondheim), Browning, Tim D. (Bristol), Brüdern, Jörg (Göttingen), Chow, Sam (Heslington, York), Cojocaru, Alina Carmen (Chicago), Conrey, Brian (San Jose), Dehnert, Fabian (Göttingen), de la Breteche, Regis (Paris), Dietmann, Rainer (Egham), Florea, Alexandra (Stanford), Fouvry, Etienne (Orsay), Frei, Christopher (Graz), Friedlander, John B. (Toronto, Ontario), Gafni, Ayla (Rochester), Goldmakher, Leo (Williamstown), Granville, Andrew J. (Montreal), Hanson, Brandon (University Park), Harper, Adam J. (Coventry), Heath-Brown, Roger (Oxford), Helfgott, Harald (Göttingen), Iwaniec, Henryk (Piscataway), Kaczorowski, Jerzy (Poznan), Koukoulopoulos, Dimitris (Montreal), Le Boudec, Pierre (Lausanne), Lemke Oliver, Robert J. (Medford), Liu, Jianya (Shandong), Maier, Helmut (Ulm), Marmon, Oscar (Copenhagen), Matomäki, Kaisa (Turku), Maynard, James A. (Oxford), Milinovich, Micah B. (University), Montgomery, Hugh L. (Ann Arbor), Moreira Nunes, Ramon (Lausanne), Myerson, Simon (London), Parsell, Scott T. (West Chester), Perelli, Alberto (Genova), Pierce, Lillian Beatrix (Durham), Pintz, Janos (Budapest), Pollack, Paul (Athens), Radziwill, Maksym (Piscataway), Robert, Olivier (Saint-Etienne), Rodgers, Brad (Ann Arbor), Rudnick, Zeev (Tel Aviv), Salberger, Per (Göteborg), Schindler, Damaris (Utrecht), Seip, Kristian (Trondheim), Soundararajan, Kannan (Stanford), Vaughan, Robert C. (University Park), Vishe, Pankaj H. (Durham), Wooley, Trevor D. (Bristol)

13.11. – 19.11.2016 **Large Scale Stochastic Dynamics**

Organizers: Thierry Bodineau, Palaiseau
Fabio Toninelli, Villeurbanne
Bálint Tóth, Bristol/Budapest

Abstract

The goal of this workshop was to explore the recent advances in the mathematical understanding of the macroscopic properties which emerge on large space-time scales from interacting microscopic particle systems. There were 53 participants, including 4 postdocs and graduate students, working in diverse intertwining areas of probability and statistical mechanics. During the meeting, 24 talks of 50 minutes were scheduled and an evening session was organised with 10 more short talks of 10 minutes, mostly by younger participants. These talks addressed the following topics: hydrodynamic limits and hydrodynamic fluctuations with a special emphasis on KPZ fluctuations, scaling limits in percolation and random walks, approach to equilibrium in reversible systems with a strong focus on kinetically constrained dynamics.

Participants

Aggarwal, Amol (Cambridge), Avena, Luca (Leiden), Bahadoran, Christophe (Aubière), Balázs, Márton (Bristol), Bernardin, Cédric (Nice), Blondel, Oriane (Villeurbanne), Bodineau, Thierry (Palaiseau), Bolthausen, Erwin (Zürich), Caputo, Pietro (Roma), Carvalho Goncalves, Ana Patrícia (Lisboa), Chleboun, Paul (Coventry), Comets, Francis M. (Paris), Derrida, Bernard (Paris), Deuschel, Jean Dominique (Berlin), Erignoux, Clément (Rio de Janeiro, RJ), Faggionato, Alessandra (Roma), Ferrari, Pablo A. (Buenos Aires), Ferrari, Patrik L. (Bonn), Funaki, Tadahisa (Tokyo), Ganguly, Shirshendu (Berkeley), Giacomin, Giambattista (Paris), Grosskinsky, Stefan (Coventry), Gubinelli, Massimiliano (Bonn), Ioffe, Dmitri (Haifa), Jara, Milton (Rio de Janeiro), Kozma, Gady (Rehovot), Lacoin, Hubert (Rio de Janeiro), Landim, Claudio (Rio de Janeiro), Laslier, Benoit (Paris), Lubetzky, Eyal (New York), Martinelli, Fabio (Roma), Menezes, Otavio (Rio de Janeiro), Mourrat, Jean-Christophe (Lyon), Nejjar, Peter (Klosterneuburg), Olla, Stefano (Paris), Poquet, Christophe (Villeurbanne), Ráth, Balázs (Budapest), Reygner, Julien (Marne-la-Vallée), Saada, Ellen (Paris), Sasada, Makiko (Tokyo), Seppäläinen, Timo (Madison), Simon, Marielle (Villeneuve d'Ascq.), Simonella, Sergio (Garching), Spohn, Herbert (Garching), Tarrès, Pierre (Oxford), Toninelli, Cristina (Paris), Toninelli, Fabio (Villeurbanne), Toth, Balint (Bristol), Valko, Benedek (Madison), Velenik, Yvan (Geneve), Vetö, Bálint (Budapest), Werner, Wendelin (Zürich), Zeitouni, Ofer (Rehovot)

27.11. – 03.12.2016 **Heat Kernels, Stochastic Processes and Functional Inequalities**

Organizers: Masha Gordina, Storrs
Takashi Kumagai, Kyoto
Laurent Saloff-Coste, Ithaca
Karl-Theodor Sturm, Bonn

Abstract
The general topic of the workshop was the study of linear and non-linear diffusions in geometric environments including smooth manifolds, fractals and graphs, metric spaces and in random environments. The workshop brought together leading researchers from analysis, geometry and probability, and provided an excellent opportunity for interactions between scientists from these areas at different stages of their career. The unifying themes were heat kernel analysis, mass transportation problems and functional inequalities while the program straddled across a great variety of subjects and across the divide that exists between discrete and continuous mathematics.

Participants
Ambrosio, Luigi (Pisa), Andres, Sebastian (Bonn), Arnaudon, Marc (Talence), Bär, Christian (Potsdam), Barlow, Martin T. (Vancouver), Baudoin, Fabrice (West Lafayette), Bendikov, Alexander (Wroclaw), Berestycki, Nathanael (Cambridge), Chen, Li (Madrid), Chen, Zhen-Qing (Seattle), Chiarini, Alberto (Marseille), Coulhon, Thierry (Paris), Cruzeiro, Ana Bela (Lisboa), Deuschel, Jean Dominique (Berlin), Duplantier, Bertrand (Gif-sur-Yvette), Eldredge, Nathaniel (Greeley), Elworthy, David (Coventry), Erbar, Matthias (Bonn), Gantert, Nina (Garching bei München), Garban, Christophe (Villeurbanne), Gloria, Antoine (Bruxelles), Gordina, Masha (Storrs), Huesmann, Martin (Bonn), Kajino, Naotaka (Kobe), Kassmann, Moritz (Bielefeld), Kigami, Jun (Kyoto), Kopfer, Eva (Bonn), Kumagai, Takashi (Kyoto), Kuwada, Kazumasa (Tokyo), Laetsch, Thomas (New York), Ledoux, Michel (Toulouse), Li, Xue-Mei (Coventry), Maas, Jan (Klosterneuburg), Mathieu, Pierre (Marseille), Melcher, Tai (Charlottesville), Menz, Georg (Los Angeles), Mondino, Andrea (Coventry), Murugan, Mathav (Vancouver), Neel, Robert (Bethlehem), Nguyen, Tuan Anh (Berlin), Otto, Felix (Leipzig), Saloff-Coste, Laurent (Ithaca), Savare, Giuseppe (Pavia), Sousi, Perla (Cambridge), Sturm, Karl-Theodor (Bonn), Sznitman, Alain-Sol (Zürich), Thalmaier, Anton (Belvaux), Wang, Jian (Fuzhou), Winter, Anita (Essen), Wirth, Melchior (Jena), Woess, Wolfgang (Graz), Wu, Bo (Bonn), Zheng, Tianyi (La Jolla)

04.12. – 10.12.2016 **Surface Bundles**

Organizers: Benson Farb, Chicago
Ursula Hamenstädt, Bonn
Andrew Ranicki, Edinburgh

Abstract

This workshop brought together specialists in algebraic topology, low dimensional topology, geometric group theory, algebraic geometry and neighboring fields. It provided a good overview of the current developments, and highlighted significant progress in the field. Furthermore, it showed an increasing amount of interaction between specialists in different fields who are interested in the different facets of the rich theory of surface bundles.

Participants

Avramidi, Grigori (Münster), Bainbridge, Matthew (Bloomington), Bauer, David (Bonn), Behrens, Stefan (Utrecht), Benson, David J. (Aberdeen), Berglund, Alexander (Stockholm), Bowden, Jonathan (München), Brendle, Tara (Glasgow), Campagnolo, Caterina (Karlsruhe), Cantero, Federico (Barcelona), Chen, Dawei (Chestnut Hill), Chen, Lei (Chicago), Dowdall, Spencer (Nashville), Ebert, Johannes (Münster), Egas Santander, Daniela (Berlin), Farb, Benson (Chicago), Flapan, Laure (Los Angeles), Friedl, Stefan (Regensburg), Gendron, Quentin (Hannover), Giansiracusa, Jeffrey H. (Swansea), Groves, Daniel (Chicago), Grushevsky, Samuel (Stony Brook), Hambleton, Ian (Hamilton), Hamenstädt, Ursula (Bonn), Hensel, Sebastian (Bonn), Hillman, Jonathan (Sydney), Hironaka, Eriko (Tallahassee), Kastenholz, Thorben (Bonn), Kedra, Jarek (Aberdeen), Kin, Eiko (Osaka), Koberda, Thomas Michael (Charlottesville), Korkmaz, Mustafa (Ankara), Kotschick, Dieter (München), Kreck, Matthias (Bonn), Leininger, Christopher J. (Urbana), Liu, Yi (Beijing), Looijenga, Eduard J. N. (Beijing), Lück, Wolfgang (Bonn), Marcinkowski, Michal (Regensburg), Margalit, Dan (Atlanta), Masbaum, Gregor (Paris), Möller, Martin (Frankfurt), Pedron, Mark (Bonn), Pitsch, Wolfgang (Bellaterra), Putman, Andrew (Notre Dame), Ranicki, Andrew A. (Edinburgh), Reid, Alan W. (Austin), Rovi, Carmen (Bloomington), Salter, Nick (Chicago), Strenner, Balázs (Atlanta), Tshishiku, Bena (Stanford), Weiss, Michael (Münster), Zeman, Tomas (Oxford)

11.12. – 17.12.2016 **Asymptotic Phenomena in Local Algebra and Singularity Theory**

Organizers: Aldo Conca, Genova
Steven Dale Cutkosky, Columbia
Srikanth B. Iyengar, Salt Lake City

Abstract
The goal of this workshop was to highlight, and further, the interactions between local algebra and singularity theory. The timing was serendipitous for both subjects have witnessed tremendous progress recently, much of which was reported at the workshop. Three outstanding conjectures have been settled (in the past six months) and there has been significant progress on two others; what is more, at Oberwolfach we got news that there has been a major breakthrough on another long-standing open problem. Fortunately, all the researchers responsible for these developments had been invited to the workshop, and most were able to participate and present their work.

Participants
Avramov, Luchezar L. (Lincoln), Berkesch Zamaere, Christine (Minneapolis), Bhatt, Bhargav (Ann Arbor), Boij, Mats (Stockholm), Brenner, Holger (Osnabrück), Bruns, Winfried (Osnabrück), Buchweitz, Ragnar-Olaf (Toronto), Caminata, Alessio (Neuchatel), Caviglia, Giulio (West Lafayette), Chardin, Marc (Paris), Conca, Aldo (Genova), Cutkosky, Steven Dale (Columbia), Dao, Hailong (Lawrence), Eisenbud, David (Berkeley), Erman, Daniel (Madison), Hauser, Herwig (Wien), Hering, Milena (Edinburgh), Herzog, Jürgen (Essen), Huh, June E. (Princeton), Huneke, Craig (Charlottesville), Iyengar, Srikanth B. (Salt Lake City), Kuhlmann, Franz-Viktor (Katowice), Kurano, Kazuhiko (Kawasaki), Leuschke, Graham J. (Syracuse), Le Van, Dinh (Osnabrück), Lyubeznik, Gennady (Minneapolis), Ma, Linquan (Salt Lake City), McCullough, Jason G. (Lawrenceville), Murai, Satoshi (Osaka), Peeva, Irena (Ithaca), Polini, Claudia (Notre Dame), Raicu, Claudiu (Notre Dame), Römer, Tim (Osnabrück), Rossi, Maria Evelina (Genova), Schober, Bernd (Toronto, Ontario), Sega, Liana M. (Kansas City), Singh, Anurag (Salt Lake City), Smith, Gregory G. (Kingston, Ont.), Smith, Karen E. (Ann Arbor), Srinivasan, Hema (Columbia), Stevenson, Greg (Bielefeld), Symonds, Peter (Manchester), Takagi, Shunsuke (Tokyo), Takahashi, Ryo (Nagoya), Teissier, Bernard (Paris), Tucker, Kevin (Chicago), Ullery, Brooke (Salt Lake City), Ulrich, Bernd (West Lafayette), Varbaro, Matteo (Genova), Villamayor, Orlando (Madrid), Walker, Mark E. (Lincoln), Welker, Volkmar (Marburg), Zhang, Wenliang (Chicago)

2.4. Simons Visiting Professors

Die folgenden Forscherinnen und Forscher kombinierten einen Aufenthalt in Oberwolfach mit einem Aufenthalt an einer europäischen Universität, unterstützt durch die Simons Foundation.

David B. Leep, Lexington
Workshop: 1605 Algebraic Cobordism and Projective Homogeneous Varieties
Host 1: Detlev Hoffmann, Dortmund
Host 2: Karim Johannes Becher, Antwerpen

Todor Milanov, Chiba
Workshop: 1607a Topological Recursion and TQFTs
Host: Sergey Shadrin, Amsterdam

Motohico Mulase, Davis
Workshop: 1607a Topological Recursion and TQFTs
Host: Gaetan Borot, Bonn

Alexander Aue, Davis
Workshop: 1608b New Developments in Functional and Highly Multivariate Statistical Methodology
Host: Holger Dette, Bochum

Shigeyuki Kondo, Nagoya
Workshop: 1617 Moduli spaces and Modular forms
Host: Gerard van der Geer, Amsterdam

Alina Chertock, Raleigh
Workshop: 1625 Hyperbolic Techniques in Modelling, Analysis and Numerics
Host: Christian Rohde, Stuttgart

Changlong Zhong, Albany
Workshop: 1626 Algebraic K-theory and Motivic Cohomology
Host: Marc Levine, Essen

Jon A. Wellner, Seattle
Workshop: 1627a Statistics for Shape and Geometric Features
Host: Dragi Anevski, Lund

Agnès Beaudry, Chicago
Workshop: 1629 Topologie
Host: Hans-Werner Henn, Strasbourg

Emily Riehl, Baltimore, USA
Workshop: 1629 Topologie
Host: Thomas Nikolaus, Bonn

Heiko Dietrich, Clayton
Workshop: 1631 Computational Group Theory
Host: Gerhard Hiß, Aachen

James Brannick, University Park
Workshop: 1636 Self-Adaptive Numerical Methods for Computationally Challenging Problems
Host: Andreas Frommer, Wuppertal

T. Milanov

2.4. Simons Visiting Professors

The following researchers combined their stay in Oberwolfach with a research visit to a European University, supported by the Simons Foundation.

Jun Hu, Beijing
Workshop: 1638a Adaptive Algorithms
Host: Carsten Carstensen, Berlin

John Sylvester, Seattle
Workshop: 1638b Theory and Numerics of Inverse Scattering Problems
Host: Roland Griesmaier, Würzburg

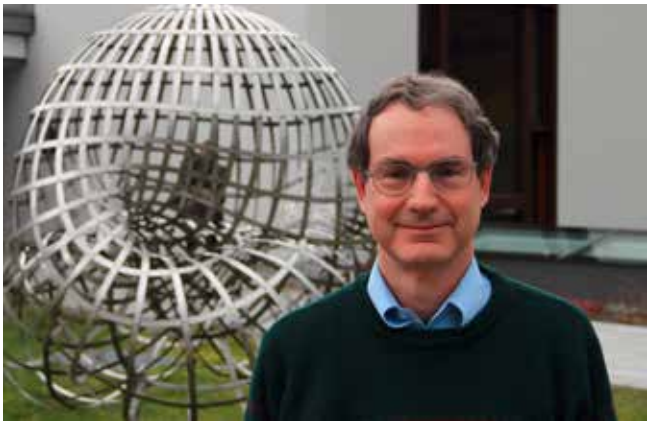
Natalia Garcia-Fritz, Toronto
Workshop: 1643 Definability and Decidability Problems in Number Theory
Host: Xavier Xarles, Bellaterra

Martin T. Barlow, Vancouver
Workshop: 1648 Heat Kernels, Stochastic Processes and Functional Inequalities
Host: Jean Dominique Deuschel, Berlin

Zhen-Qing Chen, Seattle
Workshop: 1648 Heat Kernels, Stochastic Processes and Functional Inequalities
Host: Jean Dominique Deuschel, Berlin

Anurag Singh, Salt Lake City
Workshop: 1650 Asymptotic Phenomena in Local Algebra and Singularity Theory
Host: Aldo Conca, Genua

Cameron M. Gordon, Austin
Workshop: 1651b Max Dehn: his Life, Work, and Influence
Host: David E. Rowe, Mainz



D. B. Leep

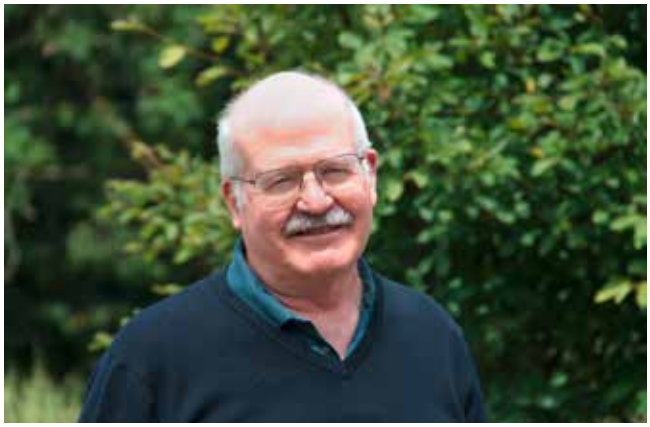
M. Mulase

A. Aue

S. Kondo

A. Chertock

C. Zhong



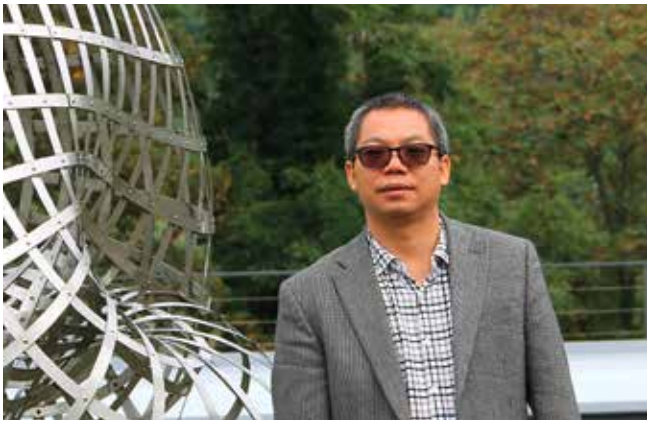
J. A. Wellner

A. Beaudry

E. Riehl

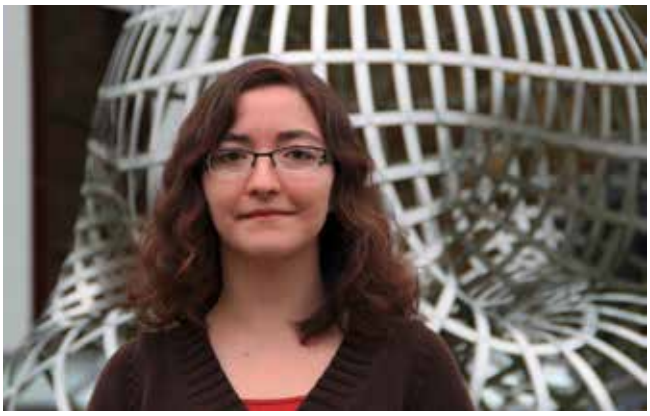
H. Dietrich

J. Brannick



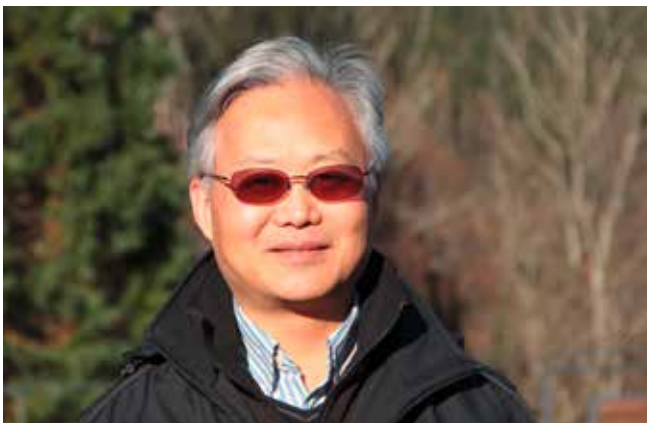
J. Hu

J. Sylvester



N. Garcia-Fritz

M. T. Barlow



Z. Chen

A. Singh

C. M. Gordon

2.5. Miniworkshops

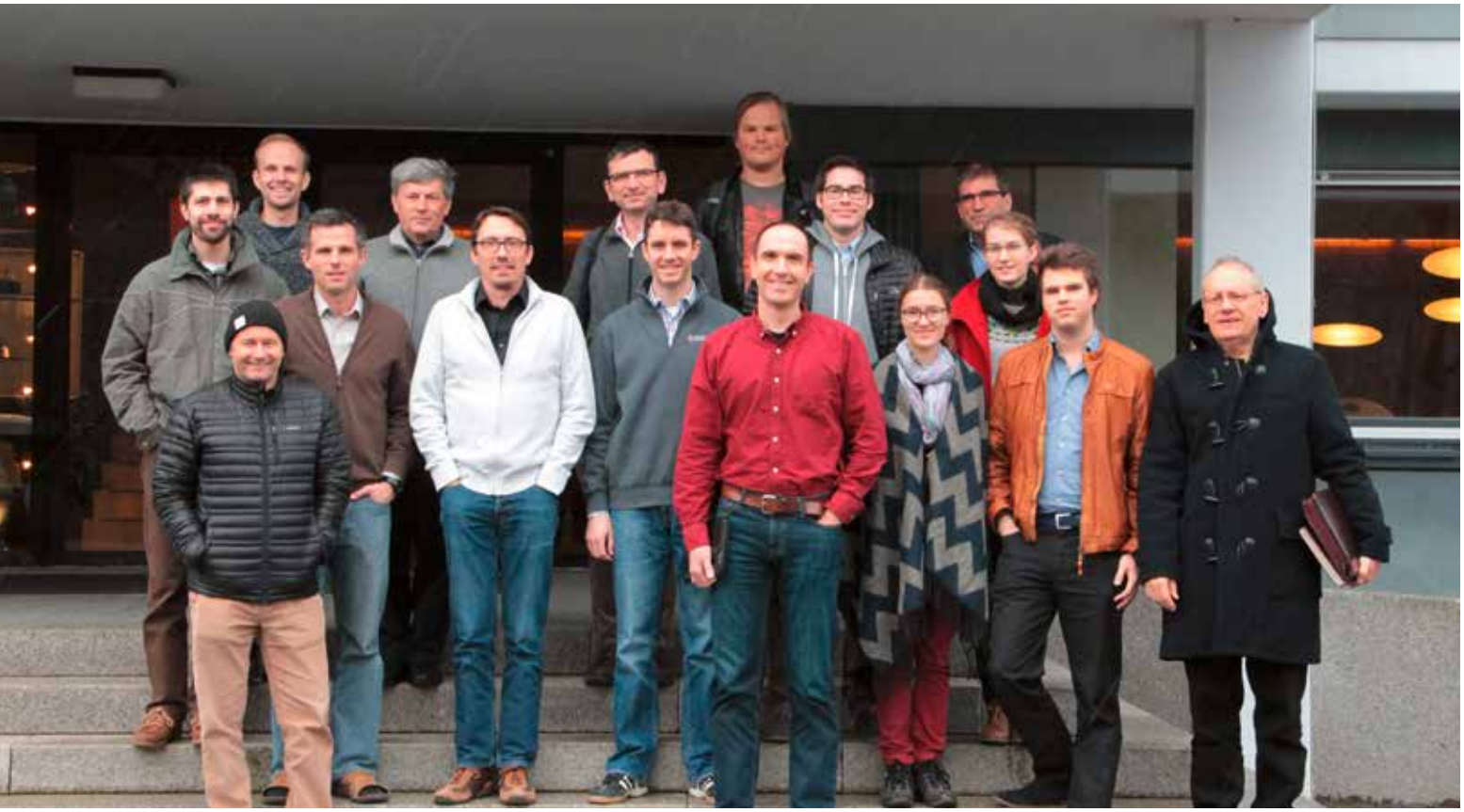
Miniworkshop 1606a

07.02. – 13.02.2016 **Operator Spaces and Noncommutative Geometry in Interaction**

Organizers: Simon Brain, Nijmegen
Magnus Goffeng, Copenhagen
Jens Kaad, Nijmegen
Bram Mesland, Hannover

Abstract
In recent years, operator space theory has made remarkable appearances in noncommutative geometry, notably in the study of C*-algebras of real reductive groups and the unbounded picture of Kasparov theory. In both these developments, a central role is played by operator modules and the Haagerup tensor product. This workshop brought together experts in the aforementioned fields to deepen this interaction.

Participants
Arici, Francesca (Nijmegen), Bearden, Alex (Houston), Blecher, David (Houston), Brain, Simon (Nijmegen), Caspers, Martijn (Münster), Cornelissen, Gunther (Utrecht), Crisp, Tyrone (Bonn), Forsyth, Iain (Hannover), Goffeng, Magnus (Göteborg), Higson, Nigel (University Park), Kaad, Jens (Nijmegen), Kennedy, Matthew (Waterloo), Lesch, Matthias (Bonn), Mesland, Bram (Hannover), Nest, Ryszard (Kobenhavn), Pisier, Gilles (Paris), Rennie, Adam Ch. (Wollongong), Shulman, Tatiana (Warszawa)



07.02. – 13.02.2016 **Applied Koopmanism**

Organizers: Didier Henrion, Toulouse
Igor Mezic, Santa Barbara
Mihai Putinar, Santa Barbara

Abstract

Koopman and Perron-Frobenius operators are linear operators that encapsulate dynamics of nonlinear dynamical systems without loss of information. This is accomplished by embedding the dynamics into a larger infinite-dimensional space where the focus of study is shifted from trajectory curves to measurement functions evaluated along trajectories and densities of trajectories evolving in time. Operator-theoretic approach to dynamics shares many features with an optimization technique: the Lasserre moment-sums-of-squares (SOS) hierarchies, which was developed for numerically solving non-convex optimization problems with semialgebraic data. This technique embeds the optimization problem into a larger primal semidefinite programming (SDP) problem consisting of measure optimization over the set of globally optimal solutions, where measures are manipulated through their truncated moment sequences. The dual SDP problem uses SOS representations to certify bounds on the global optimum. This workshop highlighted the common threads between the operator-theoretic dynamical systems and moment-SOS hierarchies in optimization and explored the future directions where the synergy of the two techniques could yield results in fluid dynamics, control theory, optimization, and spectral theory.

Participants

Ahmadi, Amir Ali (Princeton), Budisic, Marko (Madison), Gaubert, Stéphane (Palaiseau), Henrion, Didier (Toulouse), Hess, Roxana (Toulouse), Junge, Oliver (Garching bei München), Jungers, Raphael (Louvain-la-Neuve), Korda, Milan (Lausanne), Küster, Kari Valentina (Hamburg), Küster, Uwe (Stuttgart), Latushkin, Yuri (Columbia), Mauroy, Alexandre (Belvaux), Mezic, Igor (Santa Barbara), Mohr, Ryan M. (Santa Barbara), Morris, Ian David (Guildford), Putinar, Mihai (Santa Barbara), Rowley, Clarence W. (Princeton)

07.02. – 13.02.2016 **Mathematical Foundations of Isogeometric Analysis**

Organizers:
Tom Hughes, Austin
Bert Jüttler, Linz
Angela Kunoth, Köln
Bernd Simeon, Kaiserslautern

Abstract

Isogeometric Analysis (IgA) is a new paradigm which merges numerical simulations for partial differential equations (PDEs) and applied geometry. Initiated by the pioneering 2005 paper of Hughes, this new concept bridges the gap between classical finite element methods and computer aided design concepts. In the last few years, the new paradigm has revolutionized the engineering communities and triggered an enormous amount of simulations and publications. However, there are several profound theoretical issues which have not been well understood and which are currently investigated by researchers in Numerical Analysis, Approximation Theory and Applied Geometry.

Participants

Akpinar, Nur Sema (Köln), Demlow, Alan (College Station), Evans, John A. (Boulder), Harbrecht, Helmut (Basel), Hughes, Thomas J.R. (Austin), Jüttler, Bert (Linz), Kunoth, Angela (Köln), Langer, Ulrich (Linz), Lyche, Tom (Oslo), Manni, Carla (Roma), Mantzaflaris, Angelos (Linz), Mourrain, Bernard (Sophia Antipolis), Oswald, Peter (Bonn), Peters, Jörg (Gainesville), Reali, Alessandro (Pavia), Sangalli, Giancarlo (Pavia), Simeon, Bernd (Kaiserslautern)

28.02. – 05.03.2016 **PBW Structures in Representation Theory**

Organizers: Evgeny Feigin, Moscow
Ghislain Fourier, Glasgow
Martina Lanini, Edinburgh

Abstract

The PBW structures play a very important role in the Lie theory and in the theory of algebraic groups. The importance is due to the huge number of possible applications. The main goal of the workshop was to bring together experts and young researchers working in the certain areas in which PBW structures naturally appear. The interaction between the participants allowed to find new viewpoints on the classical mathematical structures and to launch the study of new directions in geometric, algebraic and combinatorial Lie theory.

Participants

Backhaus, Teodor (Köln), Bossinger, Lara (Köln), Cerulli-Irelli, Giovanni (Roma), Fang, Xin (Köln), Feigin, Evgeny (Moscow), Finkelberg, Mikhail (Moscow), Fourier, Ghislain (Glasgow), Franzen, Hans (Bonn), Hering, Milena (Edinburgh), Lanini, Martina (Edinburgh), Littelmann, Peter (Köln), Makedonskyi, Ievgen (Moscow), Orr, Daniel (Blacksburg), Reineke, Markus (Wuppertal), Roe, Joaquim (Bellaterra), Vergne, Michèle (Paris), Yakimova, Oksana (Jena)

28.02. – 05.03.2016 **Arrangements of Subvarieties, and their Applications in Algebraic Geometry**

Organizers: Thomas Bauer, Marburg
Sandra Di Rocco, Stockholm
Brian Harbourne, Lincoln
Tomasz Szemberg, Krakow

Abstract
While arrangements of hyperplanes have been studied in algebra, combinatorics and geometry for a long time, recent discoveries suggest that they (and more generally arrangements of nonlinear subvarieties) play an even more fundamental role in major problems in algebraic geometry than has yet been understood. The workshop brought into contact experts from commutative algebra and algebraic geometry working on these problems – it provided opportunities to get updated on the latest developments through talks of the participants, but also reserved time for working groups in which participants brainstormed ideas and insights in the context of high-intensity discussions aimed at initiating immediate progress on proposed problems, thereby setting the stage for on-going collaborations after the workshop.

Participants
Bauer, Thomas (Marburg), Cook, David W. (Charleston), Di Gennaro, Roberta (Napoli), Di Rocco, Sandra (Stockholm), Harbourne, Brian (Lincoln), Huizenga, Jack (University Park), Ilardi, Giovanna (Napoli), Küronya, Alex (Frankfurt), Migliore, Juan C. (Notre Dame), Nagel, Uwe (Lexington), Pokora, Piotr (Mainz), Schenck, Henry K. (Urbana), Schmitz, David (Stony Brook), Seceleanu, Alexandra (Lincoln), Szemberg, Tomasz (Krakow), Szpond, Justyna (Krakow), Urzua, Giancarlo (Santiago de Chile)

28.02. – 05.03.2016 **Topological Complexity and Related Topics**

Organizers: Mark Grant, Aberdeen
Gregory Lupton, Cleveland
Lucile Vandembroucq, Braga

Abstract
Topological complexity is a numerical homotopy invariant of topological spaces, of Lusternik-Schnirelmann type, introduced by Farber and motivated by the motion planning problem from topological robotics. This Mini-Workshop assembled researchers interested in calculating the topological complexity and its many variants, with the aim of providing a snapshot of the current state of knowledge, and shaping directions of future research.

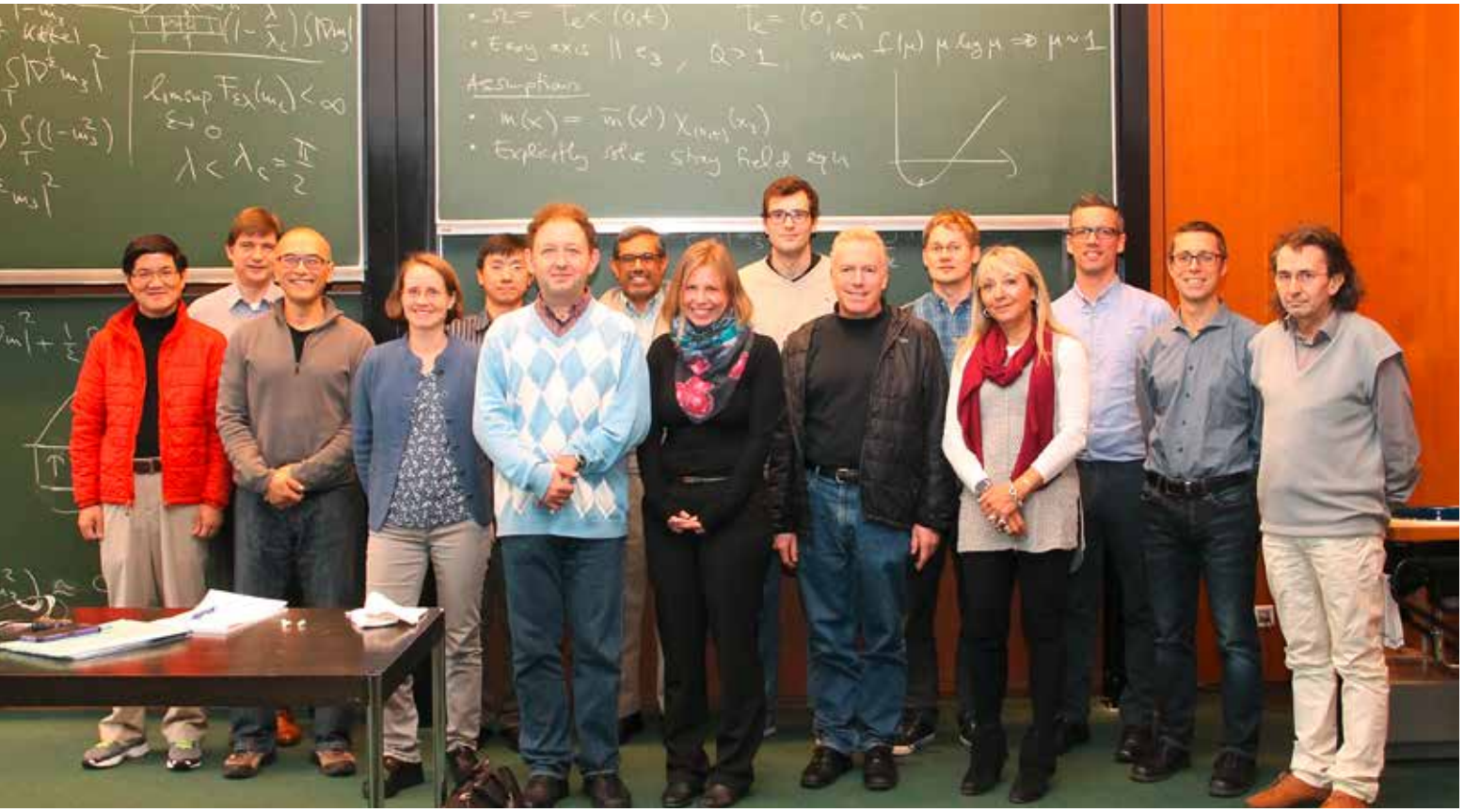
Participants
Angel, Andrés (Bogotá), Bayeh, Marzieh (Regina, Saskatchewan), Błaszczyk, Zbigniew (Poznan), Carrasquel Vera, José Gabriel (Louvain-la-Neuve), Cohen, Daniel C. (Baton Rouge), Fieldsteel, Nathan (Urbana), Franc, Aleksandra (Ljubljana), Gonzalez Espino Barros, Jesus (México D.F.), Grant, Mark (Aberdeen), Gutiérrez, Bárbara (México D.F.), Kaluba, Marek (Poznan), Lupton, Gregory M. (Cleveland), Oprea, John F. (Cleveland), Pavesic, Petar (Ljubljana), Recio Mitter, David (Aberdeen), Vandembroucq, Lucile (Braga)

30.10. – 05.11.2016
Organizers:

Fast Solvers for Highly Oscillatory Problems
Timo Betcke, London
Steffen Börm, Kiel
Sabine Le Borne, Hamburg-Harburg
Per-Gunnar Martinsson, Boulder

Abstract
The efficient numerical solution of highly oscillatory problems is one of the grand challenges of Applied Mathematics with diverse applications across the natural sciences and engineering. This workshop brings together experts in domain based methods and integral equation methods to share novel ideas and to discuss challenges on the way to developing efficient solvers at high frequencies.

Participants
Barnett, Alex (Hanover), Betcke, Timo (London), Börm, Steffen (Kiel), Chaillat-Loseille, Stéphanie (Palaiseau), Darbas, Marion (Amiens), Demanet, Laurent (Cambridge), Gander, Martin (Geneve), Gillman, Adrianna (Houston), Graham, Ivan G. (Bath), Le Borne, Sabine (Hamburg), Martinsson, Per-Gunnar (Boulder), Melenk, Jens M. (Wien), O'Neil, Michael (New York), Tang, Sunli (New York)



30.10. – 05.11.2016 **Mathematics of Magnetoelastic Materials**

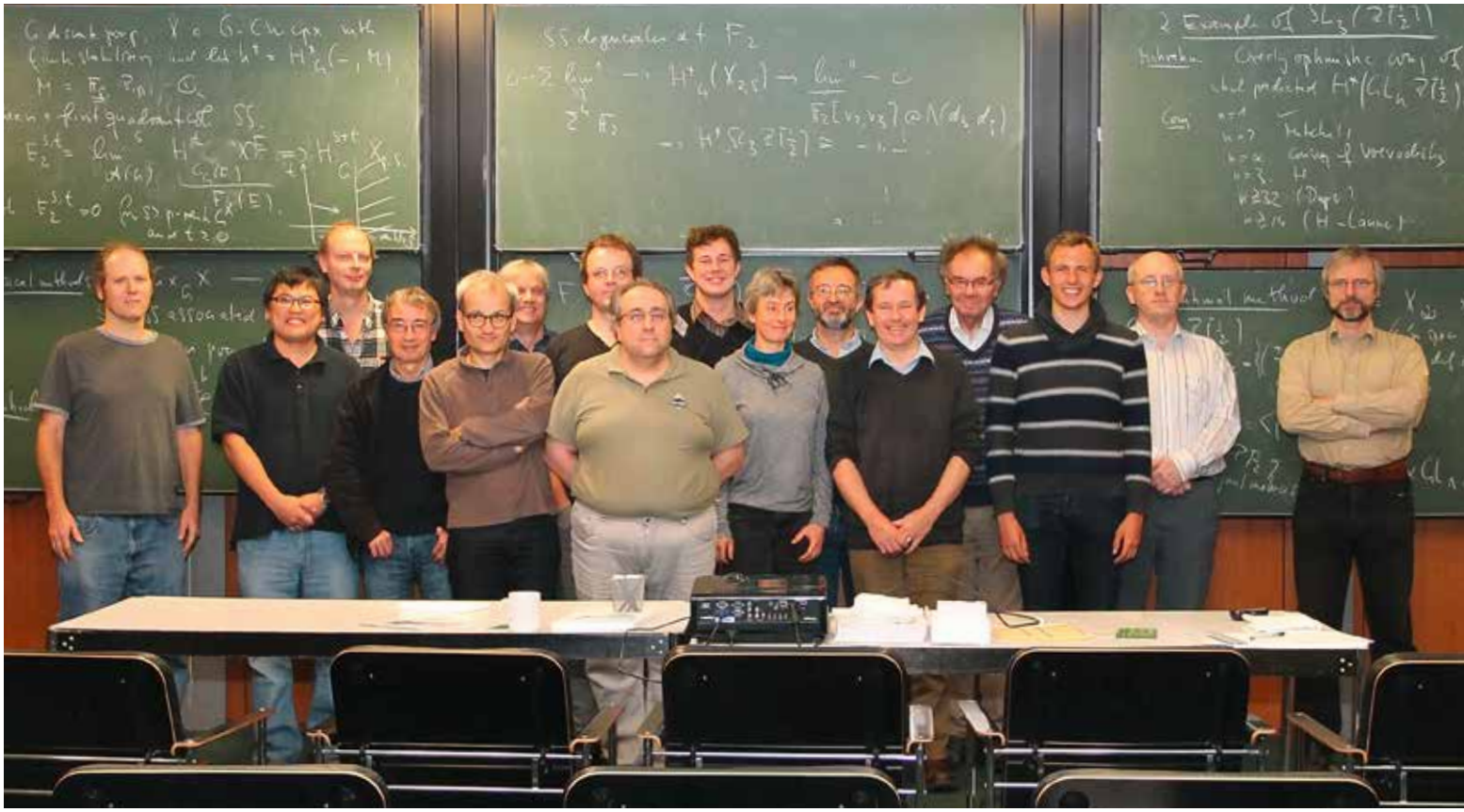
Organizers: Carlos Garcia-Cervera, Santa Barbara
Martin Kruzik, Prague
Chun Liu, University Park
Anja Schlömerkemper, Würzburg

Abstract

The unifying theme of the workshop was the mathematical modeling, analysis, and numerical simulation of materials which involve magnetic and elastic interactions. During the workshop we identified several open problems from the calculus of variations, partial differential equations and modeling which appear to be essential in the understanding of the behavior of magnetoelastic materials.

Participants

Benesova, Barbora (Würzburg), Bhattacharya, Kaushik (Pasadena), Chen, Long-Qing (University Park), Fonseca, Irene (Pittsburgh), James, Richard D. (Minneapolis), Keip, Marc-André (Stuttgart), Knüpfer, Hans (Heidelberg), Kruzik, Martin (Prague), Liu, Chun (University Park), Liu, Liping (Piscataway), Otto, Felix (Leipzig), Roubicek, Tomas (Praha), Ruggeri, Michele (Wien), Schlömerkemper, Anja (Würzburg), Stefanelli, Ulisse (Wien)



30.10. – 05.11.2016 **Computations in the Cohomology of Arithmetic Groups**

Organizers: Eva Bayer-Fluckiger, Lausanne
Philippe Elbaz-Vincent, Grenoble
Graham Ellis, Galway

Abstract
Explicit calculations play an important role in the theoretical development of the cohomology of groups and its applications. It is becoming more common for such calculations to be derived with the aid of a computer. This mini-workshop assembled together experts on a diverse range of computational techniques relevant to calculations in the cohomology of arithmetic groups and applications in algebraic K-theory and number theory with a view to extending the scope of computer aided calculations in this area.

Participants
Coulangeon, Renaud (Talence), de Jeu, Rob (Amsterdam), Dutour Sikiric, Mathieu (Zagreb), Elbaz-Vincent, Philippe (Saint-Martin-d'Heres), Ellis, Graham (Galway), Gangl, Herbert (Durham), Green, David J. (Jena), Gunnells, Paul E. (Amherst), Harder, Günter (Bonn), Henn, Hans-Werner (Strasbourg Cedex), Hutchinson, Kevin (Dublin), Lannes, Jean (Palaiseau), Nebe, Gabriele (Aachen), Rahm, Alexander D. (Luxembourg-Kirchberg), Schönnenbeck, Sebastian (Aachen), Yasaki, Dan (Greensboro)

18.12. – 23.12.2016

New interactions between homotopical algebra and quantum field theory

Organizers:
Marco Benini, Potsdam
Kasia Rejzner, York
Alexander Schenkel, Regensburg
Christoph Schweigert, Hamburg

Abstract
Recent developments in quantum field theory strongly call for techniques from homotopical algebra to develop the mathematical foundations of quantum gauge theories. This mini-workshop brought together experts working at the interface between topological field theory, quantum field theory and homotopical algebra with the goal of triggering major advances towards understanding quantum gauge theory. This was achieved via a fruitful exchange of ideas and technologies across different research communities and encouraging a comparison between recent approaches to homotopical quantum field theory.

Participants
Bartlett, Bruce (Stellenbosch), Benini, Marco (Potsdam), Bunk, Severin (Edinburgh), Cattaneo, Alberto (Zürich), Fredenhagen, Klaus (Hamburg), Haugseng, Rune (Copenhagen), Hawkins, Eli (Heslington, York), Krähmer, Ulrich (Glasgow), Mnev, Pavel (Bonn), Rejzner, Kasia (Heslington, York), Richter, Birgit (Hamburg), Scheimbauer, Claudia I. (Bonn), Schenkel, Alexander (Regensburg), Schreiber, Urs (Praha), Schweigert, Christoph (Hamburg), Szabo, Richard J. (Edinburgh)

18.12. – 23.12.2016 **Max Dehn: his Life, Work, and Influence**

Organizers: David Peifer, Asheville
Volker Remmert, Wuppertal
David E. Rowe, Mainz
Marjorie Senechal, Northampton

Abstract
This mini-workshop is part of a long-term project that aims to produce a book documenting Max Dehn's singular life and career. The meeting brought together scholars with various kinds of expertise, several of whom gave talks on topics for this book. During the week a number of new ideas were discussed and a plan developed for organizing the work. A proposal for the volume is now in preparation and will be submitted to one or more publishers during the summer of 2017.

Participants
Danilowitz, Brenda (Bethany), Epple, Moritz (Frankfurt am Main), Gordon, Cameron M. (Austin), Gray, Jeremy John (Milton Keynes), Hog-Angeloni, Cynthia (Mainz), Lorenat, Jemma (Claremont), MacHenry, Trueman (Toronto), McCleary, John (Poughkeepsie), Mühlhausen, Elisabeth (Krebeck), Ording, Philip (Bronxville), Peifer, David E. (Asheville), Reinhard, Ilka (Mainz), Remmert, Volker (Wuppertal), Rowe, David E. (Mainz), Scholz, Antina (Wuppertal), Senechal, Marjorie (Northampton)

18.12. – 23.12.2016 **Surreal Numbers, Surreal Analysis, Hahn Fields and Derivations**

Organizers: Alessandro Berarducci, Pisa
Philip Ehrlich, Athens
Salma Kuhlmann, Konstanz

Abstract
New striking analogies between H. Hahn's fields of generalised series with real coefficients, G. H. Hardy's field of germs of real valued functions, and J. H. Conway's field No of surreal numbers, have been lately discovered and exploited. The aim of the workshop was to bring quickly together experts and young researchers, to articulate and investigate current key questions and conjectures regarding these fields, and to explore emerging applications of this recent discovery.

Participants
Berarducci, Alessandro (Pisa), Fornasiero, Antongiulio (Pisa), Galeotti, Lorenzo (Hamburg), Kaiser, Tobias (Passau), Kaplan, Elliot (Urbana), Krapp, Sebastian (Konstanz), Kuhlmann, Salma (Konstanz), Lehéricy, Gabriel (Konstanz), L'Innocente, Sonia (Camerino), Mantova, Vincenzo (Leeds), Matusinski, Mickael (Talence), Müller, Simon (Konstanz), Point, Francoise (Mons), Speissegger, Patrick (Hamilton), Tressl, Marcus (Manchester)

2.6. Arbeitsgemeinschaften

Arbeitsgemeinschaft 1614

03.04. – 09.04.2016 **The Geometric Langlands Conjecture**

Organizers: Laurent Fargues, Paris
Dennis Gaitsgory, Cambridge MA
Peter Scholze, Bonn
Kari Vilonen, Evanston

Abstract

The Langlands program is a vast, loosely connected, collection of theorems and conjectures. At quite different ends, there is the geometric Langlands program, which deals with perverse sheaves on the stack of G-bundles on a smooth projective curve, and the local Langlands program over p-adic fields, which deals with the representation theory of p-adic groups. Recently, inspired by applications to p-adic Hodge theory, Fargues and Fontaine have associated with any p-adic field an object that behaves like a smooth projective curve. Fargues then suggested that one can interpret the geometric Langlands conjecture on this curve, to give a new approach towards the local Langlands program over p-adic fields.

Participants

Anschütz, Johannes (Heidelberg), Bernstein, Joseph (Tel Aviv), Bhatt, Bhargav (Ann Arbor), Bouthier, Alexis (Jerusalem), Campbell, Christopher Justin (Cambridge), Caraiani, Ana (Princeton), Chan, Charlotte (Ann Arbor), Chen, Tsao-Hsien (Evanston), Chojecki, Przemyslaw (Oxford), Colmez, Pierre (Paris), Dat, Jean-Francois (Paris), Deninger, Christopher (Münster), Dobrovolska, Galyna (Bonn), Dospinescu, Gabriel (Lyon), Fargues, Laurent (Paris), Feng, Tony (Palo Alto), Fintzen, Jessica (Cambridge), Fontaine, Jean-Marc (Orsay), Fratila, Dragos (Strasbourg Cedex), Gaisin, Ildar M. (Paris), Gaitsgory, Dennis (Cambridge), Görtz, Ulrich (Essen), Gunningham, Sam (Austin), Hamacher, Paul (Garching bei München), Hartl, Urs (Münster), Heinloth, Jochen (Essen), Hellmann, Eugen (Bonn), Hernandez, Valentin (Paris), Klingler, Bruno (Paris), Kremnitzer, Yakov (Oxford), Lau, Eike (Paderborn), Le Bras, Arthur-César (Paris), Liu, Ruochuan (Beijing), Liu, Yifeng (Evanston), Ludwig, Judith (Bonn), Madapusi Pera, Keerthi (Chicago), McBreen, Michael (Cambridge), Morel, Sophie (Princeton), Morrow, Matthew (Bonn), Niziol, Wieslawa (Lyon), Paskunas, Vytautas (Essen), Patrikis, Stefan (Salt Lake City), Pilloni, Vincent (Lyon), Rapoport, Michael (Bonn), Raskin, Sam (Cambridge), Rozenblyum, Nick (Chicago), Schneider, Peter (Münster), Scholze, Peter (Bonn), Stroh, Benoit (Villetaneuse Cedex), Varshavsky, Yakov (Jerusalem), Viehmann, Eva (Garching), Vilonen, Kari (Evanston), Wedhorn, Torsten (Darmstadt), Weinstein, Jared (Boston), Xiao, Liang (Storrs), Xue, Cong (Orsay), Xue, Ting (Melbourne), Zhou, Rong (Cambridge), Zhu, Xinwen (Pasadena), Zhu, Yihang (Cambridge)

09.10. – 14.10.2016 **Diophantine Approximation, Fractal Geometry and Dynamics**

Organizers: Victor Beresnevich, York
Sanju Velani, York

Abstract

Recently conjectures by Schmidt and by Davenport were solved in papers by Dzmitry Badziahin, Andrew Pollington and Sanju Velani, and by Victor Beresnevich. The methods which they used are the source for a growing number of works in Diophantine approximation, fractal geometry and flows on homogeneous spaces, and their full power is still far from being well understood. The goal of this workshop was to introduce those methods to a broader audience, and to allow for an opportunity to further their development.

Participants

Adiceam, Faustin (Heslington, York), Aistleitner, Christoph (Graz), Allen, Demi (York), An, Jinpeng (Beijing), Baker, Simon (Coventry), Barral, Julien (Villetaneuse Cedex), Beresnevich, Victor (Heslington, York), Biggs, Kirsti (Bristol), Bugeaud, Yann (Strasbourg Cedex), Chow, Sam (Heslington, York), Damanik, David (Houston), David, Ofir (Haifa), Dayan, Yiftach (Ramat Aviv, Tel Aviv), de Saxcé, Nicolas (Villetaneuse Cedex), Durand, Arnaud (Orsay), Ernvall-Hytönen, Anne-Maria (Abo), Faltings, Gerd (Bonn), Ganguly, Arijit (Mumbai), German, Oleg (Moscow), Ghosh, Anish (Mumbai), Gonzalez Robert, Gerardo (Aarhus), Guan, Lifan (Beijing), Husakova, Hanna (Minsk), Kim, Dong Han (Seoul), Kirsebom, Maxim (Bremen), Konieczny, Jakub M. (Oxford), Kudzin, Aliaksei (Minsk), Landesberg, Or (Jerusalem), Marchese, Luca (Villetaneuse Cedex), Marnat, Antoine (Graz), Measures, Kayleigh Erika (Heslington, York), Nair, Radhakrishnan (Liverpool), Nesharim, Erez (Beer Sheva), Palmer, Matthew (Bristol), Pollington, Andrew D. (Arlington), Ramirez, Felipe (Middletown), Simmons, David (Heslington, Yorkshire), Smilansky, Yotam (Tel Aviv), Solomon, Yaar (Beer Sheva), Stepanova, Natalia (Moscow), Summerer, Leonhard (Wien), Tamam, Nattalie (Ramat Aviv, Tel Aviv), Technau, Marc (Würzburg), Technau, Niclas (Graz), Velani, Sanju (Heslington, York), Weiss, Barak (Tel Aviv), Yasufuku, Yu (Tokyo), Zafeiropoulos, Agamemnon (Heslington, York), Zhuravleva, Victoria (Moscow), Zorin, Evgeniy (Heslington, York)

2.7. Oberwolfach Seminare

Oberwolfach Seminar 1620a

15.05. – 21.05.2016 **Data Assimilation: The Mathematics of Connecting Dynamical Systems to Data**

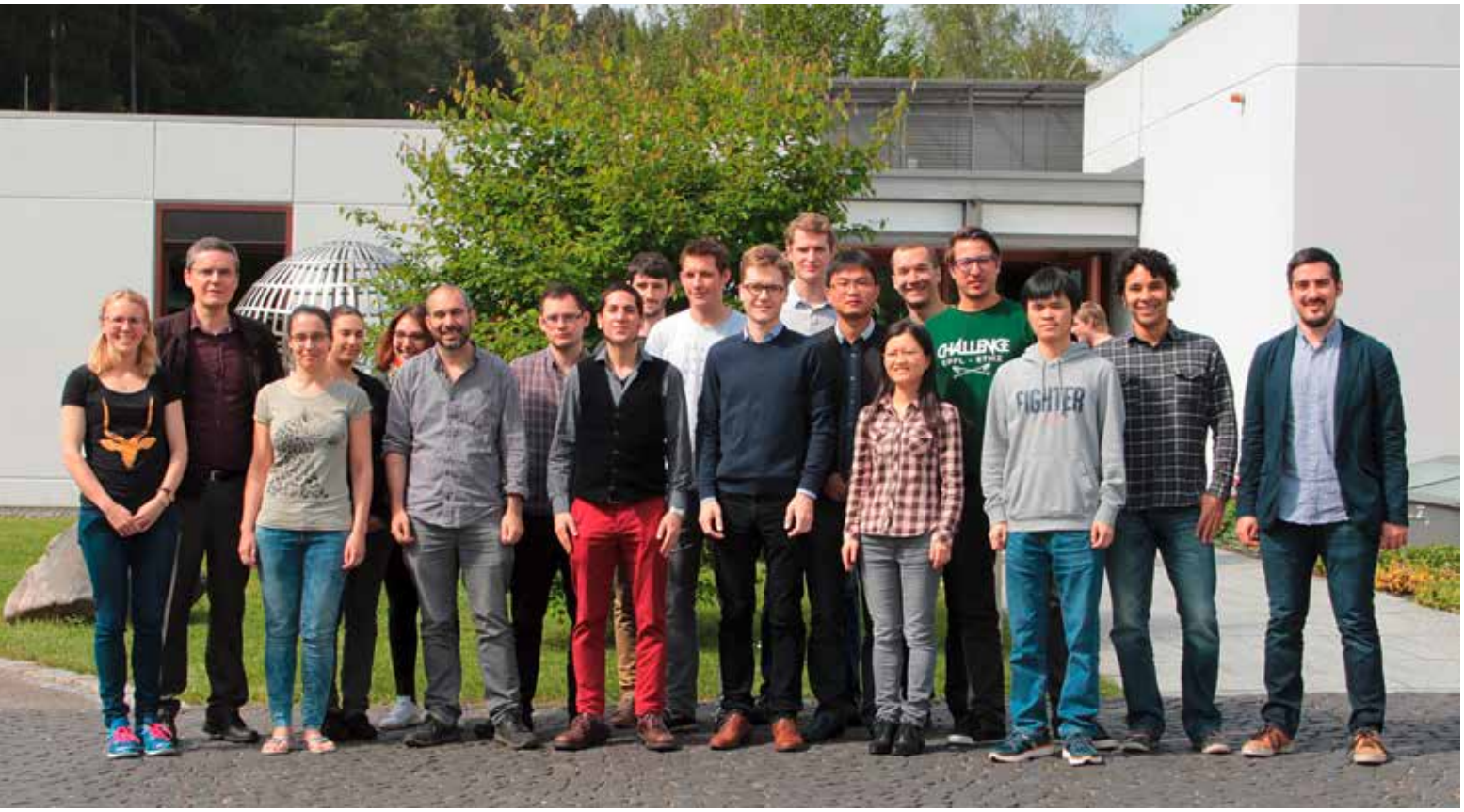
Organizers: Jana de Wiljes, Potsdam
Sebastian Reich, Potsdam and Reading
Andrew Stuart, Warwick

Abstract

The seamless integration of large data sets into computational models provides one of the central challenges for the mathematical sciences of the 21st century. When the computational model is based on dynamical systems and the data is time ordered, the process of combining data and models is called data assimilation. The seminar provided an introduction to the mathematical and algorithmic foundations of modern data assimilation methodologies. The first part of the seminar covered the mathematical principles of deterministic and probabilistic approaches to state estimation in the context of filtering and smoothing. The classical variational and control theoretic viewpoints were described and then their probabilistic counterparts developed, using an underpinning Bayesian formulation. The second part was devoted to recent algorithmic advances on sequential Monte Carlo methods for state and parameter estimation, together with an overview of the analysis of importance sampling based methods, especially in the high dimensional or small noise regimes when the computational complexity is high. The final third part introduced the concept of model error and describe methods for dealing with misspecified models and model comparison.

Participants

Ballesio, Marco (Jeddah), Ben Hammouda, Chiheb (Jeddah), Bigoni, Caterina (Lausanne), Chada, Neil (Coventry), Cockayne, Jon (Coventry), de Leeuw, Bart (Amsterdam), de Wiljes, Jana (Potsdam), Gorodetsky, Alex (Cambridge), Gregory, Alastair (London), Hastermann, Gottfried (Berlin), Hewer, Rüdiger (Bonn), Hollborn, Stefanie (Offenbach), Hossain, Mohmmad Alamgir (Burnaby), Kärcher, Mark (Aachen), Knöchel, Jane (Golm), Lehtonen, Jonathan (Helsinki), Levine, Matthew (New York,), Leweke, Samuel (Köln), Lie, Han Cheng (Berlin), Maclean, John (Raleigh), Mohamad, Mustafa (Cambridge), Mowlavi, Saviz (Cambridge), Reich, Sebastian (Potsdam), Reinhardt, Maria (Potsdam), Schenkels, Nick (Antwerp), Schinagl, Katharina (Bonn), Spantini, Alessio (Cambridge), Stuart, Andrew (Coventry), Voigt, Matthias (Berlin), Wolfers, Sören (Thuwal), Xia, Chao (Providence), Yan, Dong (Leiden), Zahm, Olivier (Cambridge)



15.05. – 21.05.2016 **Recent Advances on the Global Nonlinear Stability of Einstein Spacetimes**

Organizers: Mihalis Dafermos, Princeton
Philippe LeFloch, Paris
Qian Wang, Oxford

Abstract
Einstein's field equation of general relativity is one of the most important geometric partial differential equations. In recent years, the mathematical research in general relativity has made spectacular progress in major directions. This Seminar provided an introduction to some of these important advances, especially the exterior stability and internal structure of black hole spacetimes, the global nonlinear stability of Minkowski spacetime, self-gravitating massive fields and the theory of modified gravity.

Participants
Czimek, Stefan (Paris), Dafermos, Mihalis (Princeton), Dunn, Jake (London), Franzen, Anne (Lisboa), Ghanem, Sari (Saint-Martin-d'Heres), Giuliani, Andrew (Waterloo, Ontario), Graf, Olivier (Paris), Johnson, Thomas (London), Kehle, Christoph (München), Lasserre, Marvin (Paris), LeFloch, Philippe G. (Paris), Ma, Siyuan (Golm), Nungesser, Ernesto (Madrid), Oliver, Jesus R. (La Jolla), Paganini, Claudio (Golm), Radermacher, Katharina (Stockholm), Somé, Claire (Dijon), Stingo, Annalaura (Villetaneuse Cedex), Wang, Jinhua (Golm), Wang, Qian (Oxford), Wei, Changhua (Shanghai), Wyatt, Zoe (Edinburgh), Xiang, Shuyang (Paris)

16.10. – 22.10.2016 **Berkovich Spaces and Degenerations of Calabi-Yau Varieties**

Organizers: Sebastian Boucksom, Paris
Mattias Jonsson, Michigan
Johannes Nicaise, London and Leuven

Abstract
The aim of the seminar was to give a general survey of some recent developments connecting non-archimedean geometry to the study of degenerations of Calabi-Yau varieties in the context of Mirror Symmetry and the Minimal Model Program. The following major topics were discussed: Introduction to Berkovich spaces; relation with valuation theory and birational geometry. Construction and basic properties of the essential skeleton; connections with the Minimal Model Program; application to Igusa zeta functions. Potential theory on Berkovich spaces and the Yau-Tian-Donaldson conjecture. Degenerations of Calabi-Yau varieties and Mirror Symmetry.

Participants
Botero, Ana Maria (Berlin), Boucksom, Sebastien (Paris), Cauwbergs, Thomas (Bielefeld), Codogni, Giulio (Roma), Fantini, Lorenzo (Palaiseau), Felten, Simon (Mainz), Forey, Arthur (Paris), Giovenzana, Luca (Chemnitz), Gross, Andreas (London), Hisamoto, Tomoyuki (Nagoya), Jell, Philipp (Regensburg), Jonsson, Mattias (Ann Arbor), Mazzon, Enrica (London), Nicaise, Johannes (Heverlee), Shen, Jifeng (New Haven), Shokrieh, Farbod (Ithaca), Soto, Alejandro (Frankfurt), Stevenson, Matthew (Ann Arbor), Sustretov, Dmitry (Villeneuve d'Ascq.), Ulirsch, Martin (Toronto), Welliaveetil, John (London), Yamamoto, Yuto (Geneve), Yu, Tony Yue (Paris)

16.10. – 22.10.2016
Organizers:

Perfectoid Spaces
Rebecca Bellovin, London
Brian Conrad, Stanford
Kiran Kedlaya, San Diego
Jared Weinstein, Boston

Abstract
This Oberwolfach Seminar introduced 21 participants to the theory of perfectoid fields. The topics which were discussed during the week included: Perfectoid fields and the tilting equivalence, Banach algebras and perfectoid algebras, some almost ring theory, an introduction to adic spaces, and modular curves at infinite level.

Participants
Bellovin, Rebecca (London), Breutmann, Paul (Münster), Conrad, Brian (Stanford), de Daruvar, Vincent (Paris), Dotto, Andrea (London), Enns, John (Toronto), Fan, Tian-Qi (Chicago), Fan, Yangyu (Milano), Gao, Hui (Helsinki), Gvirtz, Damián (London), Henkel, Timo (Darmstadt), Hesse, Jens (Darmstadt), Heuer, Ben (London), Karnataki, Aditya (Mumbai), Kedlaya, Kiran S. (La Jolla), Le, Daniel (Princeton), Lourenco, Joao (Bonn), Mocz, Lucia (Princeton), Panozzo, Simone (Milano), Reinecke, Emanuel (Ann Arbor), Shchedrina, Daria (Nottingham), Wear, Peter (La Jolla), Weinstein, Jared (Boston), Youcis, Alex (Berkeley), Zhou, Yiwen (Chicago)

20.11. – 26.11.2016 **Different Mathematical Perspectives on Description of Unresolved Scales in Multiscale Systems**

Organizers: Carsten Hartmann, Berlin
Illia Horenko, Lugano
Rupert Klein, Berlin
Terence O'Kane, Hobart

Abstract
The mathematical modelling of multiscale phenomena poses a variety of challenges of very different nature. The seminar reviewed these aspects and introduced mathematical techniques for addressing them. Scale analysis and (multiple scales) asymptotic techniques elucidate the mechanisms generating scale separations and multiscale dynamics in the setting of deterministic ODE/PDE problems. Statistical mechanics combined with renormalization techniques address systems with continuous hierarchies of scales lacking scale separations. Variational methods yield coarse-grained images of chaotic and dissipative dynamics. Data-driven models of unresolved scales using information-theoretical concepts invoke entropy principles for model discrimination. They were discussed in the context of Machine Learning. Data-driven stochastic time series analysis is key in investigations of complex systems. We addressed parametric/nonparametric, stationary/nonstationary, statistical, machine-learning, and artificial intelligence approaches, and regularization of ill-posed problems.

Participants
Bergold, Paul (Garching), Craib, Philip (Hamburg), de Leeuw, Bart (Amsterdam), Hartmann, Carsten (Cottbus), Heiland, Jan (Magdeburg), Horenko, Illia (Lugano), Jain, Varun (Delft), Klein, Rupert (Berlin), Li, Guanglian (Bonn), Mizerová, Hana (Mainz), Natale, Andrea (London), Neureither, Lara (Cottbus), Nüske, Feliks (Berlin), O'Kane, Terence (Hobart, Tasmania), Pieroth, Martin (Frankfurt am Main), Podlesny, Joscha (Berlin), Pospisil, Lukas (Lugano), Quer, Jannes (Berlin), Shapkalijevski, Metodija (Berlin), Simon, Konrad (Hamburg), Strehlau, Markus (Cottbus), von Larcher, Thomas (Berlin), Wiebe, Bettina (Mainz), Wu, Hao (Berlin), Zacharuk, Matthias (Frankfurt a.M.)

20.11. – 26.11.2016 **Mathematical Theory of Evolutionary Fluid-Flow Structure Interactions**

Organizers: Barbara Kaltenbacher, Klagenfurt
Igor Kukavica, Los Angeles
Irena Lasiecka, Memphis
Roberto Triggiani, Memphis

Abstract
This Seminar was focused on the analysis and control of three distinct yet broadly related topics: uid-structure interaction, ow-structure interaction and sound-structure interaction. In each case the overall model is described by systems of strongly coupled PDEs. The emphasis was put on demonstrating how the coupling on an interface changes drastically the overall dynamics with respect to the dynamics determined by each component.

Participants
Altmann, Robert (Berlin), Anikushyn, Andrii (Kiev), Castle, Lucas (Raleigh), Charoenphon, Sutthirut (Memphis), Geredeli, Pelin Güven (Ankara), Hundertmark, Anna (Mainz), Kaltenbacher, Barbara (Klagenfurt), Kukavica, Igor (Los Angeles), Lasiecka, Irena (Memphis), Lu, Yongjin (Petersburg), Nägele, Philipp (Freiburg i. Br.), Nunes Monteiro, Rodrigo (Rio de Janeiro), Özsari, Türker (Izmir), Pokojovy, Michael (Karlsruhe), Sembukutti Liyanage, Buddhika Priyasad (Memphis), Szulc, Katarzyna (Warsaw), Täufer, Matthias (Dortmund), Triggiani, Roberto (Memphis), Tuffaha, Amjad (Sharjah), Wan, Xiang (Charlottesville)

2.8. Fortbildungsveranstaltungen/Training weeks

Trainings- und Abschlussseminar für die Internationale Mathematik-Olympiade 1621b

22.05. – 28.05.2016 **Trainings- und Abschluß-Seminar für die Internationale Mathematik-Olympiade**

Organizer: Jürgen Prestin, Lübeck

Abstract

The Institute hosted again the annual final training week for especially gifted German pupils to prepare for the International Mathematical Olympiad.

Participants

Allin, Alexander (Erfurt), Armbruster, Alexander (Unterhaching), Armbruster, Susanne (Unterhaching), Brindle, Benjamin (Horb), Bürger, Sebastian (Torgau), Drees, Martin (Nürnberg), Gehring, Lukas (Nördlingen), Juran, Branko (Berlin), Meyer, David (Gießen), Meyer, Sebastian (Dresden), Nöbel, Christian (Königswinter), Paul, Manfred (Würzburg), Plotz, Thomas (Hamburg), Wagner, Ferdinand (Leibzig), Walter, Jonas (Rostock), Wolf, Arne (Leibzig)

2.9. Research in Pairs

Die folgenden Forscherinnen und Forscher nahmen 2016 am Research in Pairs Programm teil:

Kreiß, Jens-Peter (Braunschweig) Paparoditis, Efsthatios (Nicosia)	03.01.-16.01.2016
Aurentz, Jared L. (Oxford) Mach, Thomas (Leuven)	03.01.-16.01.2016
Lapid, Erez (Rehovot) Tadic, Marko (Zagreb)	10.01.-23.01.2016
Vasyunin, Vasily (St. Petersburg) Volberg, Alexander (East Lansing)	17.01.-12.03.2016
Defant, Andreas (Oldenburg) Sevilla Peris, Pablo (Valencia)	31.01.-13.02.2016
Litterick, Alastair James (Auckland) Thomas, Adam (London)	31.01.-13.02.2016
Krattenthaler, Christian (Vienna) Müller, Thomas W. (London)	07.02.-27.02.2016
Coquand, Thierry (Göteborg) Lombardi, Henri (Besancon) Neuwirth, Stefan (Besancon) Tête, Claire (Göteborg)	14.02.-27.02.2016
Fino, Anna Maria (Torino) Kath, Ines (Greifswald)	14.02.-27.02.2016
Hantke, Maren (Magdeburg) Müller, Siegfried (Aachen)	28.02.-26.03.2016
Feireisl, Eduard (Prague) Gwiazda, Piotr (Warsaw) Swierczewska-Gwiazda, Agniezska (Warsaw) Wiedemann, Emil (Bonn)	28.02.-12.03.2016
Lovejoy, Jeremy (Paris) Osburn, Robert (Dublin)	13.03.-26.03.2016
Jensen, David (Lexington) Len, Yoav (Saarbrücken)	13.03.-26.03.2016
Barlet, Daniel (Vandoeuvre-Lès-Nancy) Magnússon, Jón Ingolfur (Reykjavík)	27.03.-09.04.2016
Geiges, Hansjörg (Köln) Onaran, Sinem Celik (Ankara)	27.03.-09.04.2016
Erdmann, Karin (Oxford) Santana Ramires, Ana Paula (Coimbra) Yudin, Ivan (Coimbra)	27.03.-09.04.2016
Kuznetsova, Yulia (Besancon) Mcdonald, Edward (Sydney) Zanin, Dmitriy (Sydney)	03.04.-30.04.2016
Nikolov, Geno P. (Sofia) Shadrin, Alexei (Cambridge)	10.04.-30.04.2016
Rowlett, Julie (Göteborg) Tacy, Melissa (Adelaide)	10.04.-23.04.2016
De Jeu, Rob (Amsterdam) Gangl, Herbert (Durham) Rahm, Alexander (Galway) Yasaki, Dan (Greensboro)	17.04.-30.04.2016

The following researchers attended the Research in Pairs program in 2016:

D'Alessandro, Giampaolo (Southampton) Papoff, Francesco (Glasgow)	24.04.-07.05.2016
Chataur, David (Amiens) Saralegi-Aranguren, Martin E. (Lens) Tanré, Daniel (Lille)	01.05.-14.05.2016
Jojic, Dusko (Banja Luka) Nekrasov, Ilia (St. Petersburg) Panina, Gaiane (St. Petersburg) Zivaljevic, Rade T. (Belgrad)	08.05.-21.05.2016
Assainova, Olga (Dijon) Klein, Christian (Dijon) Mclaughlin, Kenneth (Tuscon) Miller, Peter David (Ann Arbor)	15.05.-28.05.2016
Denham, Graham (London, CA) Suciu, Alexander (Boston)	22.05.-04.06.2016
Khanin, Konstantin M. (Toronto) Teplinsky, Alexey (Kiev)	22.05.-11.06.2016
Moroianu, Andrei (Versailles) Semmelmann, Uwe (Stuttgart)	29.05.-11.06.2016
Estrada-Dominguez, Sergio (Murcia) Iacob, Alina (Statesboro)	05.06.-18.06.2016
Gekhtman, Michael (Notre Dame) Shapiro, Michael (East Lansing) Vainshtein, Alek (Haifa)	19.06.-02.07.2016
Hwang, Hyung Ju (Pohang) Lee, Ho (Seoul) Nungesser, Ernesto (Madrid) Stalker, John (Dublin)	26.06.-09.07.2016
Disconzi, Marcelo M. (Nashville) Ebin, David G. (Stony Brook) Misiolek, Gerard K. (Notre Dame) Preston, Stephen C. (Boulder)	10.07.-06.08.2016
Sinapova, Dima (Chicago) Unger, Spencer (Los Angeles)	10.07.-23.07.2016
Beckermann, Bernhard (Villeneuve D'Ascq) Putinar, Mihai (Newcastle) Saff, Edward B. (Vanderbilt) Stylianopoulos, Nikos (Nicosia)	17.07.-30.07.2016
Polini, Claudia (Notre Dame) Ulrich, Bernd (West Lafayette)	24.07.-06.08.2016
Dimca, Alexandru (Nice) Ibadula, Denis (Bucharest) Macinic, Anca Daniela (Constanta)	07.08.-20.08.2016
Bokil, Vrushali (Corvallis) Cheng, Yingda (East Lansing) Li, Fengyan (Troy)	07.08.-20.08.2016
Itenberg, Ilia (Paris) Kharlamov, Viatcheslav (Strasbourg) Shustin, Eugenii (Tel Aviv)	07.08.-27.08.2016

Hsiao, George C. (Newark) Wendland, Wolfgang L. (Stuttgart)	21.08.-17.09.2016
Feehan, Paul M. (Piscataway) Owens, Brendan (Glasgow)	21.08.-26.08.2016
Grabowski, Lukasz (Lancaster) Hladky, Jan (Praha) Pikhurko, Oleg (Coventry)	21.08.-03.09.2016
Herzog, Jürgen (Essen) Hibi, Takayuki (Osaka) Ohsugi, Hidefumi (Hyogo)	04.09.-17.09.2016
Cai, Zhiqiang (West Lafayette) Starke, Gerhard (Essen) Zhang, Shun (Hong Kong) Cai, Difeng (West Lafayette)	11.09.-17.09.2016
Bolte, Jens (London) Egger, Sebastian (Haifa) Keppeler, Stefan (Tübingen)	18.09.-08.10.2016
Barbaroux, Jean-Marie (Toulon) Hundertmark, Dirk (Karlsruhe) Ried, Tobias (Karlsruhe) Wugalter, Semjon (Karlsruhe)	25.09.-08.10.2016
Biswas, Shibananda (Kolkata) Misra, Gadadhar (Bangalore) Roy, Subrata Shyam (Kolkata)	02.10.-15.10.2016
Gauthier, Paul M. (Montreal) Nestoridis, Vassili (Athens) Papadopoulos, Athanese (Strasbourg)	09.10.-29.10.2016
Müller-Hermes, Alexander (Copenhagen) Nechita, Ion (Toulouse) Reeb, David (Hannover)	09.10.-29.10.2016
Dzhafarov, Damir D. (Storrs) Hirschfeldt, Denis R. (Chicago) Patey, Ludovic (Paris)	30.10.-12.11.2016
Genovese, Giuseppe (Zürich) Tantari, Daniele (Pisa)	13.11.-26.11.2016
Afshari, Bahareh (Wien) Leigh, Graham E. (Göteborg)	27.11.-10.12.2016
Bleak, Colin (St Andrews) Moore, Justin (Ithaca)	04.12.-17.12.2016
Lee, Seung Jin (Seoul) Morse, Jennifer (Charlottesville) Schilling, Anne (Davis)	04.12.-17.12.2016
Kassel, Adrien (Zürich) Levy, Thierry (Paris)	04.12.-17.12.2016
Groechenig, Michael (London) Wyss, Dimitry (Lausanne) Ziegler, Paul (London)	11.12.-23.12.2016

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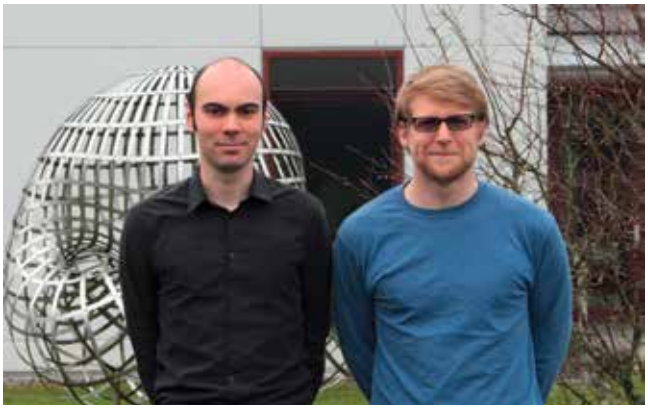

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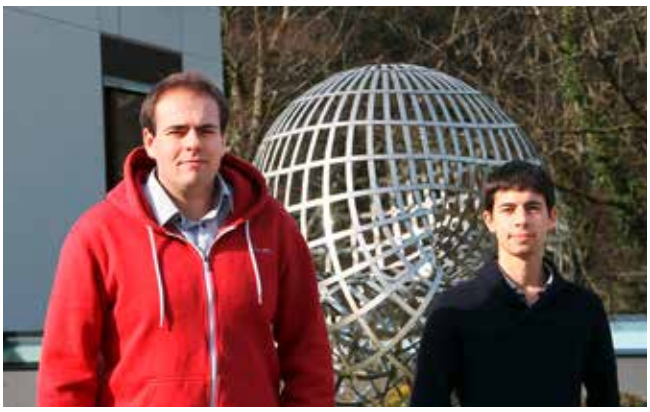

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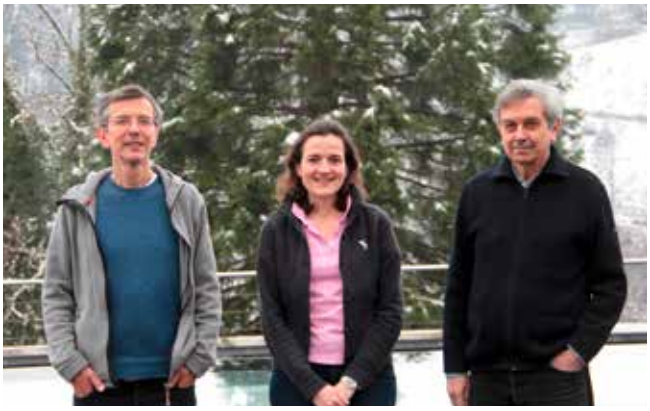

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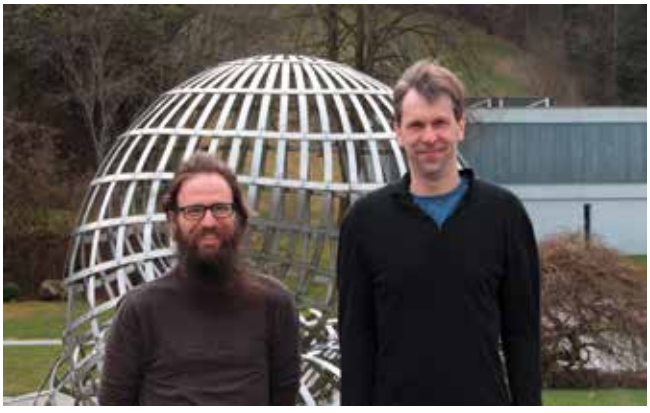

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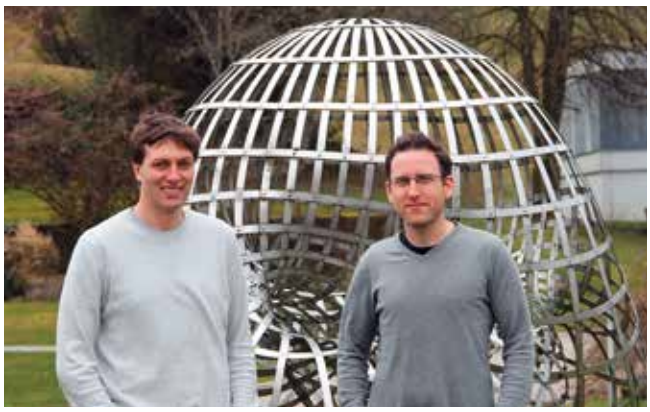

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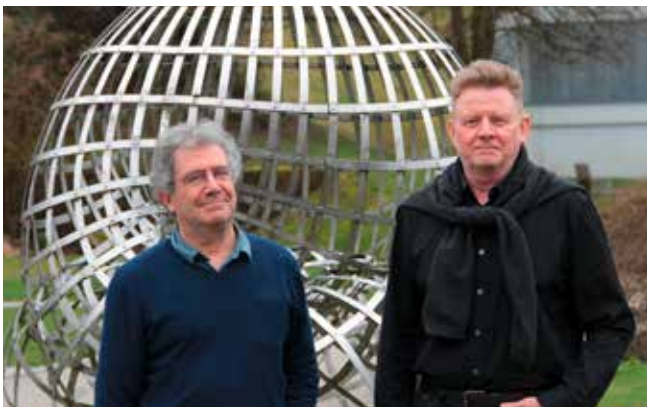

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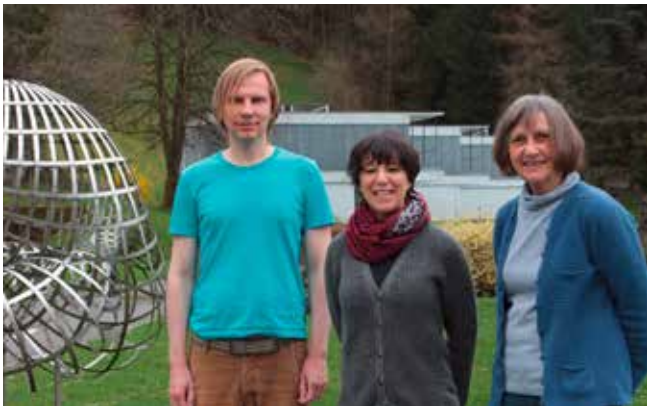

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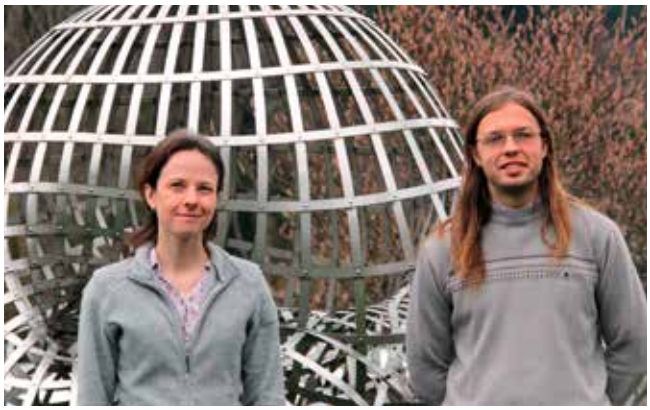

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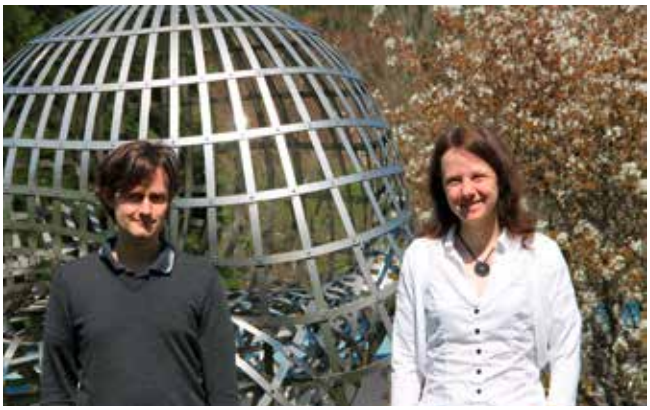

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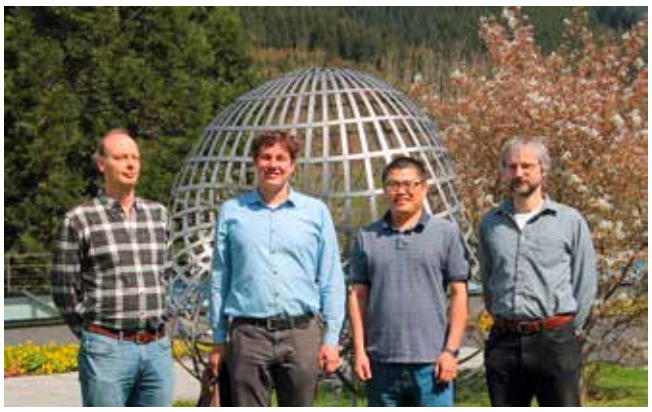

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F. Papoff, G. D'Alessandro

D. Tanre, D. Chataur, M. E. Saralegi-Aranguren

R. T. Zivaljevic, G. Panini, D. Jojic, I. Nekrasov

C. Wu-Miller, K. McLaughlin, P. D. Miller, O. Assainova, C. Klein

A. I. Suciu, G. Denham

A. Teplinsky, K. M. Khanin

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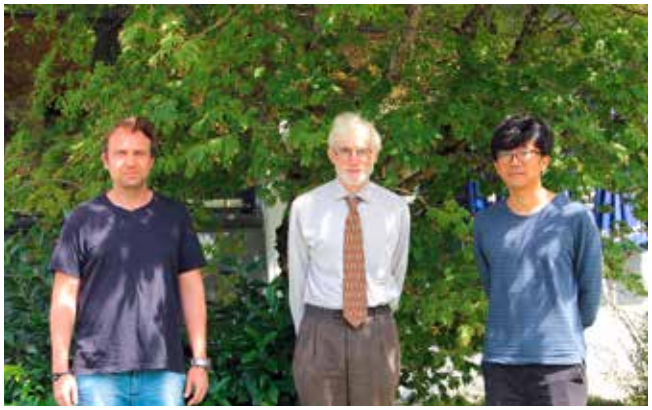

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D. Sinapova, S. Unger

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B. Ulrich, C. Polini

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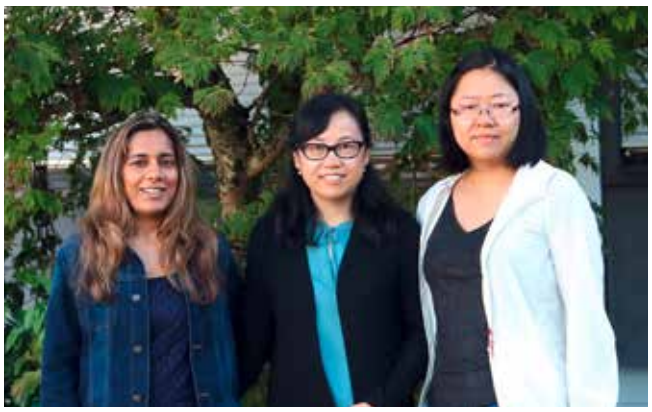

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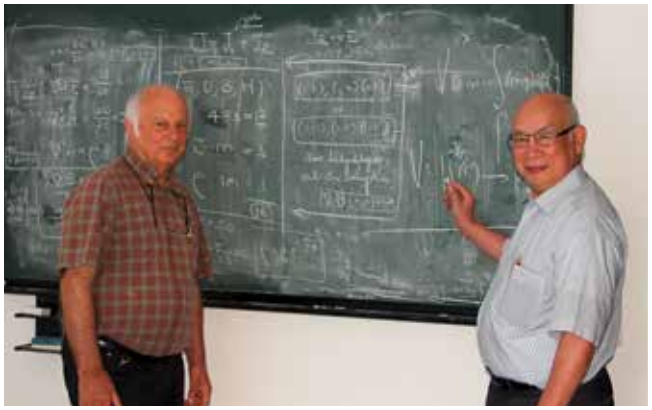

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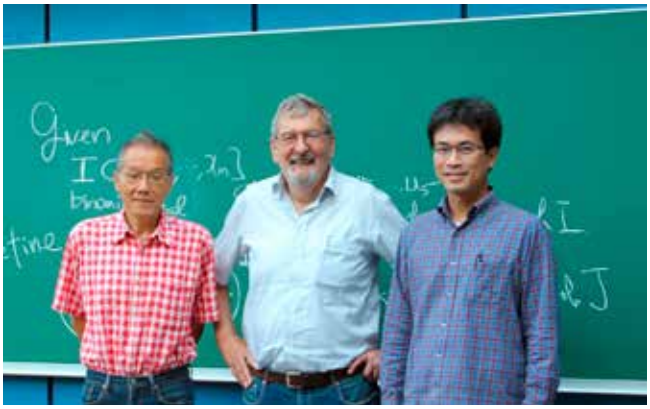

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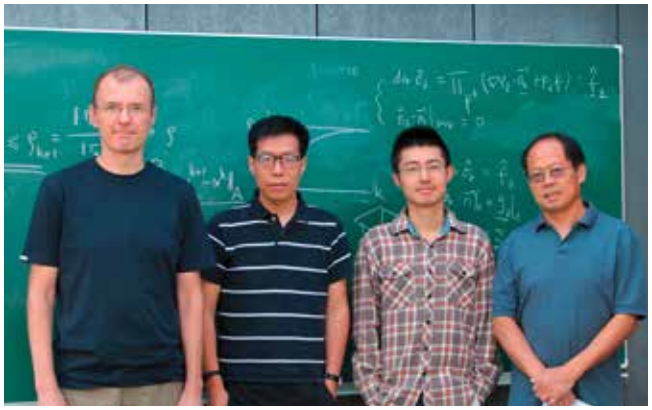

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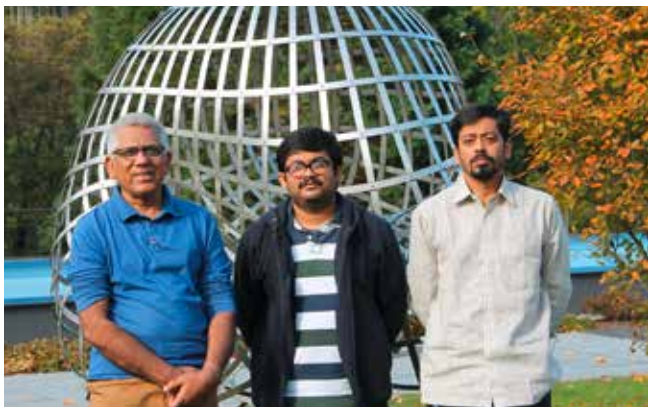

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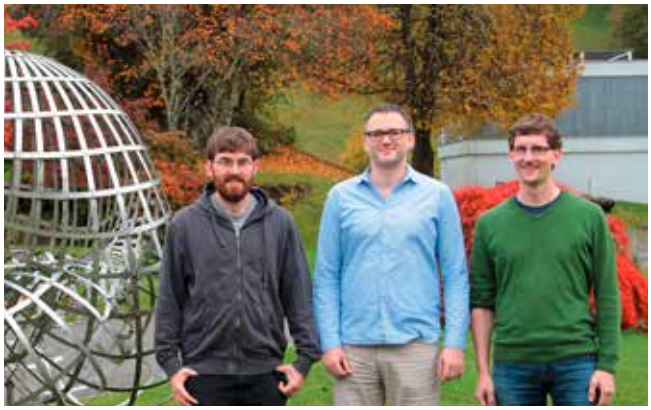

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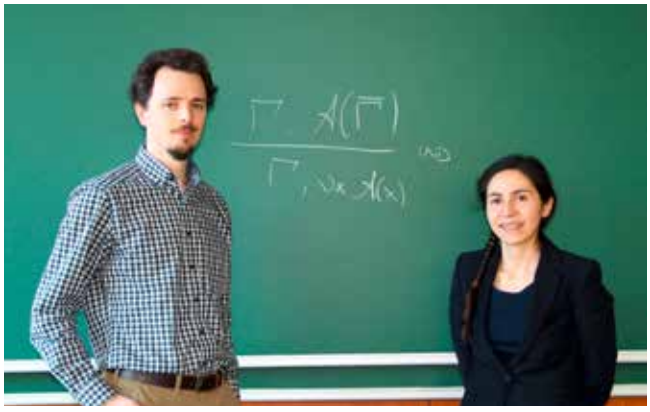

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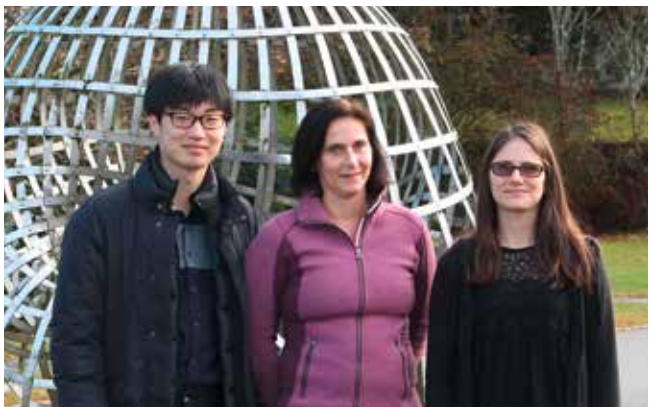

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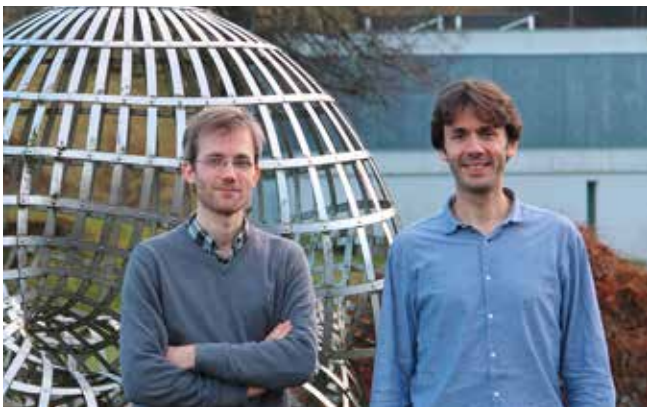

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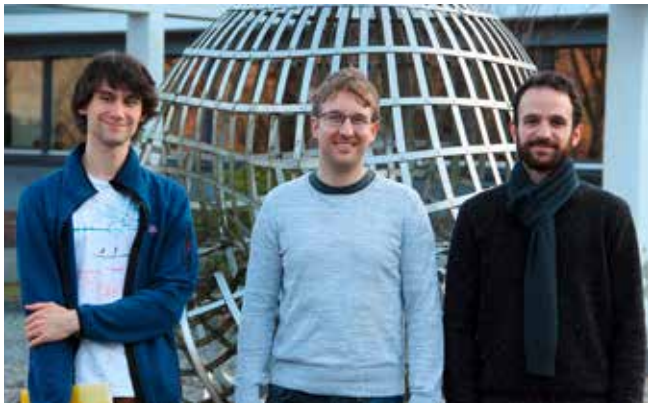


M. Groechenig, P. Ziegler, D. Wyss

2.10. Oberwolfach Leibniz Fellows

2007 wurde am Mathematischen Forschungsinstitut Oberwolfach (MFO) ein neues Postdoktorandenprogramm eingeführt. Das Ziel dieses Programms ist es, herausragende junge Mathematikerinnen und Mathematiker bei der Realisierung eines eigenen Forschungsprojekts während einer wichtigen Phase ihrer wissenschaftlichen Laufbahn zu unterstützen. Das MFO bietet hierfür ungestörte Arbeitsbedingungen mit einer exzellenten Infrastruktur in einem internationalen Umfeld. 2016 wurden die folgenden Forscherinnen und Forscher in diesem Programm gefördert:

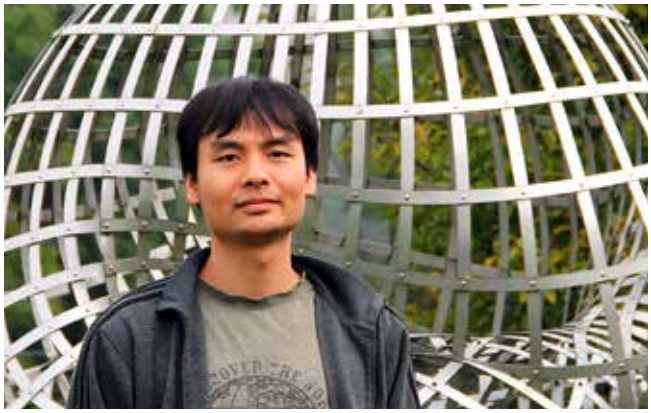
Beginning in 2007 the Mathematisches Forschungsinstitut Oberwolfach (MFO) has set up a new program for postdoctoral researchers. The focus of this program is to support outstanding young mathematical researchers in the realization of their own research projects during an important period of their scientific career. The MFO offers undisturbed working conditions with an excellent infrastructure embedded in an international environment. In 2016 the following researchers participated in this program:

Esposito, Chiara (Würzburg)	**28.02.-26.03.2016**
without external researchers	
Spilioti, Polyxeni (Bonn)	**01.05.-23.07.2016**
without external researchers	
Faber, Eleonore (Ann Arbor)	**19.06.-30.07.2016**
external guest researchers:	
Benito, Angélica (Madrid)	19.06.-01.07.2016
Ingalls, Colin (Fredericton)	15.07.-30.07.2016
Buchweitz, Ragnar-Olaf (Toronto)	17.07.-30.07.2016
Nguyen, The Cuong (Hue City)	**03.07.-29.09.2016**
without external researchers	
Dann, Susanna (Wien)	**31.07.-19.08.2016**
external guest researchers:	
Abardia, Judit (Frankfurt)	14.08.-19.08.2016
Bernig, Andreas (Frankfurt)	14.08.-18.08.2016
Lupini, Martino (Pasadena)	**31.07.-02.09.2016**
external guest researchers:	
Hartz, Michael P. (Waterloo)	31.07.-05.08.2016
Hoff, Daniel (La Jolla)	07.08.-13.08.2016
Gardella, Eusebio (Münster)	15.08.-27.08.2016
Fernandez-Culma, Edison (Cordoba)	**25.08.-23.11.2016**
without external researchers	
Ezome Mintsa, Tony Mack Robert (Franceville)	**29.10.-26.11.2016**
without external researchers	

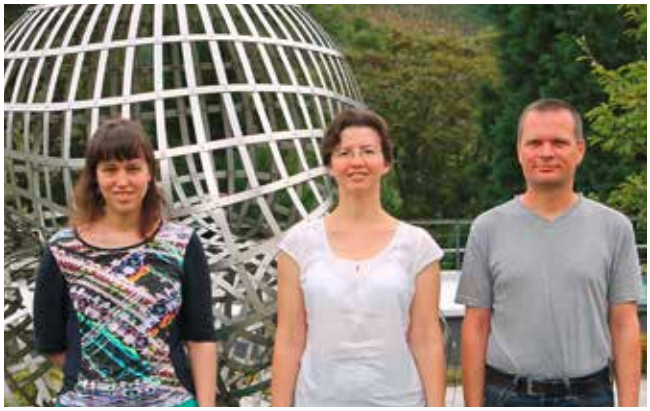
C. Esposito

P. Spilioti

E. Faber



T. C. Nguyen



J. Abardia, S. Dann, A. Bernig

M. Lupini, D. Hoff

E. A. Fernandez-Culma

T. M. R. Ezome Mintsa

2.11. Publikationen 2016

Das MFO unterstützt die Idee von Open Access. Daher sind alle Publikationen auf der Webseite www.mfo.de elektronisch frei verfügbar (mit Ausnahme der Buchreihe Oberwolfach Seminars beim Birkhäuser Verlag).

Oberwolfach Reports (OWR)

OWR wird in Zusammenarbeit mit dem Publishing House der EMS veröffentlicht und enthält die Ergebnisse der Workshops, Miniworkshops und Arbeitsgemeinschaften in Form von erweiterten Abstracts der Vorträge. 2016 sind die Bände OWR 13.1 bis 13.4 mit mehr als 3.600 Seiten erschienen.

2.11. Publications 2016

The MFO supports the idea of open access. Hence, all publications are freely available on the website www.mfo.de (with the exception of the book series Oberwolfach Seminars from Birkhäuser).

Oberwolfach Reports (OWR)

OWR is published in cooperation with the EMS publishing house and contains extended abstracts of the talks in the Workshops, Mini-Workshops, and Arbeitsgemeinschaften. In 2016, the issues OWR 13.1 to 13.4 were published with more than 3,600 pages in total.

Oberwolfach Preprints (OWP)

In OWP werden Resultate von längerfristigen Forschungsaufenthalten (RiP und OWLF) publiziert, aber auch von mathematischen Vorträgen am MFO im Rahmen von besonderen Veranstaltungen, z.B. der Oberwolfach Vorlesung. 2016 sind die folgenden Preprints erschienen:

Oberwolfach Preprints (OWP)

OWP mainly contains research results related to a longer stay in Oberwolfach (RiP and OWLF), but this can also include an Oberwolfach Lecture, for example. The following preprints were published in 2016:

- OWP 2016 - 26
  Title: Finitary Proof Systems for Kozen's μ
  Authors: Bahareh Afshari and Graham E. Leigh (RiP 2016)
- OWP 2016 - 25
  Title: The Initial and Terminal Cluster Sets of an Analytic Curve
  Author: Paul Gauthier (RiP 2016)
- OWP 2016 - 24
  Title: Boundary Representations of Operator Spaces, and Compact Rectangular Matrix Convex Sets
  Authors: Adam H. Fuller, Michael Hartz and Martino Lupini (OWLF 2016)
- OWP 2016 - 23
  Title: The Berry-Keating Operator on a Lattice
  Authors: Jens Bolte, Sebastian Egger and Stefan Keppeler (RiP 2016)
- OWP 2016 - 22
  Title: On Weak Weighted Estimates of Martingale Transform
  Authors: Fedor Nazarov, Alexander Reznikov, Vasily Vasyunin and Alexander Volberg (RiP 2016)

- OWP 2016 - 21
  Title: Spherical Arc-Length as a Global Conformal Parameter for Analytic Curves in the Riemann Sphere
  Authors: Paul Gauthier, Vassili Nestoridis and Athanase Papadopoulos (RiP 2016)
- OWP 2016 - 20
  Title: Killing Tensors on Tori
  Authors: Konstantin Heil, Andrei Moroianu and Uwe Semmelmann (RiP 2016)
- OWP 2016 - 19
  Title: Late-Time Behaviour of Israel Particles in a FLRW Spacetime with $\Lambda>0$
  Authors: Ho Lee and Ernesto Nungesser (RiP 2016)
- OWP 2016 - 18
  Title: Getzler Rescaling via Adiabatic Deformation and a Renormalized Local Index Formula
  Authors: Karsten Bohlen and Elmar Schrohe (OWLF 2015)
- OWP 2016 - 17
  Title: Alexander *r*-Tuples and Bier Complexes
  Authors: Dusko Jojic, Ilya Nekrasov, Gaiane Panina and Rade Zivaljevic (RiP 2016)
- OWP 2016 - 16
  Title: On Local Combinatorial Formulas for Chern Classes of Triangulated Circle Bundle
  Authors: Nikolai Mnev and Georgy Sharygin (RiP 2012)
- OWP 2016 - 15
  Title: On the L2 Markov Inequality with Laguerre Weight
  Authors: Gino Nikolov and Alexei Shadrin (RiP 2016)
- OWP 2016 - 14
  Title: Totally Acyclic Complexes
  Authors: Sergio Estrada, Xianhui Fu and Alina Iacob (RiP 2016)
- OWP 2016 - 13
  Title: Analytic Structure in Fibers
  Authors: Richard M. Aron, Javier Falcó, Domingo García and Maunel Maestre (RiP 2015)
- OWP 2016 - 12
  Title: Dirichlet Approximation and Universal Dirichlet Series
  Authors: Richard M. Aron, Frédéric Bayart, Paul M. Gauthier, Manuel Maestre and Vassili Nestoridis (RiP 2015)
- OWP 2016 - 11
  Title: Plethystic Vertex Operators and Boson-Fermion Correspondences
  Authors: Bertfried Fauser, Peter D. Jarvis and Ronald C. King (RiP 2014)
- OWP 2016 - 10
  Title: Legendrian Lens Space Surgeries
  Authors: Hansjörg Geiges and Sinem Onaran (RiP 2016)
- OWP 2016 - 09
  Title: Tensor Representations of $q(\infty)$
  Authors: Dimitar Grantcharov and Vera Serganova (RiP 2015)
- OWP 2016 - 08
  Title: On Densities of Lattice Arrangements Intersecting Every i-Dimensional Affine Subspace
  Authors: Bernardo González Merino and Matthias Henze (RiP 2014)
- OWP 2016 - 07
  Title: Generalized Entropy Method for the Renewal Equation with Measure Data
  Authors: Piotr Gwiazda and Emil Wiedemann (RiP 2016)
- OWP 2016 - 06
  Title: A Graphical Interface for the Gromov-Witten Theory of Curves
  Authors: Renzo Cavalieri, Paul Johnson, Hannah Markwig and Dhruv Ranganathan (RiP 2015)

- OWP 2016 - 05
  Title: Rational Approximation on Products of Planar Domains
  Authors: Richard M. Aron, Paul M. Gauthier, Manuel Maestre, Vassili Nestoridis and Javier Falcó (RiP 2015)
- OWP 2016 - 04
  Title: Regularity and Energy Conservation for the Compressible Euler Equations
  Authors: Eduard Feireisl, Piotr Gwiazda, Agnieszka Świerczewska-Gwiazda and Emil Wiedemann (RiP 2016)
- OWP 2016 - 03
  Title: Fourier-Mukai Transform on Weierstrass Cubics and Commuting Differential Operators
  Authors: Igor Burban and Alexander Zheglov (RiP 2015)
- OWP 2016 - 02
  Title: Yet Another Algorithm for the Symmetric Eigenvalue Problem
  Authors: Jared L. Aurentz, Thomas Mach, Raf Vandebril and David S. Watkins (RiP 2016)
- OWP 2016 - 01
  Title: Real Group Orbits on Flag Ind-Varieties of SL (∞, C)
  Authors: Mikhail V. Ignatyev, Ivan Penkov and Joseph A. Wolf (OWLF 2015)

Schnappschüsse moderner Mathematik

In den „Schnappschüssen moderner Mathematik aus Oberwolfach" bereiten Teilnehmerinnen und Teilnehmer der wissenschaftlichen Programme des MFO einen besonders spannenden Aspekt ihrer Forschung für die interessierte Öffentlichkeit auf. Im Jahr 2016 sind insgesamt 16 Schnappschüsse aus unterschiedlichen mathematischen Gebieten erschienen.

Snapshots of modern mathematics

In the "snapshots of modern mathematics from Oberwolfach" participants of the scientific programs at the MFO explain an especially exciting aspect of their research to an interested public. 16 snapshots from distinct mathematical areas have been published in 2016:

- No. 15/2016: Towards a Mathematical Theory of Turbulence in Fluids
  Jacob Bedrossian
- No. 14/2016: Profinite groups
  Laurent Bartholdi
- No. 13/2016: The adaptive finite element method
  Dietmar Gallistl
- No. 12/2016: Footballs and donuts in four dimensions
  Steven Klee
- No. 11/2016: The Willmore Conjecture
  Nikolai Nowaczyk
- No. 10/2016: Prime Tuples in Function Fields
  Lior Bary-Soroker
- No. 9/2016: Polyhedra and commensurability
  Rafael Guglielmetti, Matthieu Jacquemet
- No. 8/2016: Fokus-Erkennung bei Epilepsiepatienten mithilfe moderner Verfahren der Zeitreihenanalyse
  Manfred Deistler, Andreas Gräf
- No. 7/2016: Wie steuert man einen Kran?
  Robert Altmann, Jan Heiland
- No. 6/2016: High performance computing on smartphones
  Anthony T. Patera, Karsten Urban

- No. 5/2016: Symmetry and characters of finite groups
  Eugenio Giannelli, Jay Taylor
- No. 4/2016: Das Problem der Kugelpackung
  Maria Dostert, Stefan Krupp, Jan Hendrik Rolfes
- No. 3/2016: On the containment problem
  Tomasz Szemberg and Justyna Szpond
- No. 2/2016: Random sampling of domino and lozenge tilings
  Éric Fusy
- No. 1/2016: Swarming robots
  Magnus Egerstedt

3. Infrastruktur und Finanzen

3.1. Übersicht der Bereiche

Die wissenschaftliche Arbeit der Gastforscher am Institut wird durch eine effiziente Infrastruktur ermöglicht.

Von besonderer Bedeutung ist die Bibliothek, die in der mathematischen Forschung eine ähnliche Rolle spielt wie das Labor in den Naturwissenschaften. Die Bibliothek des MFO zählt zu den weltweit besten Spezialbibliotheken in der Mathematik und steht den Wissenschaftlern rund um die Uhr zur Verfügung.

Daneben spielt der Bereich der Informationstechnologie eine wichtige Rolle, sowohl direkt für die wissenschaftliche Arbeit (elektronische Publikationen, Datenbanken und mathematische Software), als auch für die weltweite Kommunikation der Forscher untereinander (Email, Internet und Informationsdienste).

Zur Planung, Durchführung und Begleitung der wissenschaftlichen Programme waren am Institut etwa 25 Stellen in den Bereichen der wissenschaftlichen Verwaltung, Bibliothek, IT-Abteilung, Verwaltungsleitung, Gästebetreuung und Hauswirtschaft besetzt. Für die effiziente, konzentrierte Arbeit der Forscher am MFO sind dabei die abgeschiedene Lage, die hervorragende wissenschaftliche Infrastruktur, und nicht zuletzt auch die ideale Betreuung einschließlich Unterbringung und Verpflegung im Gästehaus, direkt neben dem Tagungs- und Bibliotheksgebäude, wichtige Faktoren.

Die folgenden Abschnitte geben einen eingehenden Bericht über die genannten Bereiche.

3.2 Bibliothek

Die Bibliothek ist und bleibt für die Wissenschaftler in Oberwolfach das wichtigste Arbeitsmittel. Vor allem die Forscher in den Programmen „Research in Pairs" und „Oberwolfach Leibniz Fellows" nutzen die Bibliothek äußerst intensiv, aber auch für die Teilnehmer der einzelnen Workshops ist sie unverzichtbar. Immer wieder kommen Mathematiker nach Oberwolfach, um Literatur zu bearbeiten, die für sie sonst nicht zugänglich ist. Als Präsenzbibliothek ist sie für die Teilnehmer der Forschungsprogramme rund um die Uhr geöffnet. Neben dem hohen internationalen Standard des wissenschaftlichen Programms und den exzellenten Rahmenbedingungen für den persönlichen Gedankenaustausch ist die Bibliothek ein wichtiger Grund

3. Facilities and Finances

3.1. Overview on the divisions

The MFO has set up an excellent infrastructure for scientific research activities.

The library represents a vital part of this infrastructure and plays an important role, similar to laboratories in experimental sciences. The MFO's library is one of the world's most excellent libraries in mathematics and can be used by the guest researchers 24 hours a day.

But also information technology is of great importance for assisting research activities (electronic publications, database and mathematical software), and also to ensure worldwide communication among the scientific community (e-mail, internet, and information services).

For the planning and realization of the scientific program approximately 25 positions in various divisions, such as scientific and administration management, library, IT-service, guest service, and housekeeping are provided. Besides the excellent scientific infrastructure it is also the Institute's remote location, and the excellent service with board and lodging in our guest house close to the conference and library building, that guarantees efficient and concentrated working conditions for our guests.

In the following detailed information will be given on the various divisions.

3.2 Library

The library has been and will continue to be the most important working tool for scientific research at Oberwolfach. It is used most intensively especially by the researchers visiting the MFO as part of the Research in Pairs program and the Oberwolfach Leibniz Fellow program, but also by the participants of the Workshop program. Repeatedly, mathematicians are visiting Oberwolfach in order to use literature to which they wouldn't have access otherwise. As a reference library, it can be used by the Institute's guests 24 hours a day. Besides the high international standard of the scientific program and the excellent working conditions, the library is an important factor for the high reputation of the MFO worldwide. In times of dramatically

für das hohe Ansehen des MFO weltweit. Angesichts dramatisch steigender Preise bei den wissenschaftlichen Zeitschriften ist es schwierig, das erreichte Niveau zu halten oder gar zu steigern. Dies war nur möglich durch Spenden der Carl Friedrich von Siemens Stiftung sowie durch Sachspenden von Verlagen.

Das MFO nimmt seit 1995 am Südwestdeutschen Bibliotheksverbund (SWB) teil. Die Arbeit im Verbund sowie die durch das Bibliotheksservice-Zentrum Baden-Württemberg (BSZ) als betreuende Institution bereitgestellte Software bedeuten für das Institut eine erhebliche Erleichterung bei der Verwaltung der Bibliotheksbestände.

3.2.1. Bestandsüberblick

Zum Jahresende 2016 belief sich der im elektronischen Katalog nachgewiesene Gesamtbestand an Büchern auf etwa 60.320 Bände. Hinzu kamen etwa 31.000 Zeitschriftenbände. Darüber hinaus standen den Institutsgästen ca. 6.500 Dissertationen, 640 laufende Zeitschriften-Abonnements in gedruckter und/oder elektronischer Form sowie weitere ca. 5.500 lizenzierte elektronische Zeitschriften (inkl. der DFG-geförderten Nationallizenzen) zur Verfügung.

3.2.2. Bestandsentwicklung

Der Bestand an Büchern wurde im Jahr 2016 um insgesamt 2.570 Bände vermehrt. Davon hat die Bibliothek 788 Bände im Rahmen der ständigen Buchausstellung erhalten. Mit Mitteln der Siemens Stiftung wurden 287 Bücher erworben.

Zum Jahresende 2016 hat das MFO 643 Zeitschriften laufend bezogen. Davon wurden 527 durch ein reguläres Abonnement gegen Rechnung bezogen. Im Rahmen eines Tauschabkommens erhielten wir 70 Titel, weitere 46 erhielten wir als Geschenk.

Um die Versorgung mit elektronischer Fachinformation an deutschen Hochschulen, Forschungseinrichtungen und wissenschaftlichen Bibliotheken nachhaltig zu verbessern, finanziert die Deutsche Forschungsgemeinschaft seit 2004 den Erwerb von National- sowie sogenannten Allianzlizenzen. Das MFO hat im Rahmen dieser Nationallizenzen zusätzlich zu den etwa 630 regulären elektronischen Zeitschriftenabonnements weitere ca. 5.500 Zeitschriften elektronisch zur Verfügung stellen können.

3.2.3. Buchausstellung

Die ständige Buchausstellung gibt interessierten wissenschaftlichen Verlagen die Möglichkeit, ihre Neuerscheinungen im Bereich Mathematik

increasing prices for scientific journals it is difficult to keep this level; this has only been possible because of support from the Carl-Friedrich von Siemens Stiftung and book donations from publishing houses.

Since 1995 the MFO has been a member of the Südwestdeutscher Bibliotheksverbund (SWB), which, together with the software provided by the Bibliotheksservice-Zentrum Baden-Württemberg (BSZ) as supporting institution, facilitates the cataloging of our library collection enormously.

3.2.1. Overview of the inventory

By the end of 2016 the stock of books included in our electronic catalog totaled approx. 60,320 volumes and approx. 31,000 volumes of bound journals. In addition to that, approx. 6,500 dissertations, 640 current subscriptions to journals (printed and/or electronically) as well as about 5,500 additional licensed electronic journals (incl. German National Licences, funded by the DFG) were available to the Institute's guests.

3.2.2. Development of the inventory

The book inventory increased in 2016 by 2,570 volumes in total; 788 of these were donations for the permanent book exhibition. 287 volumes were bought with means from the Siemens Stiftung.

By the end of 2016, the Institute subscribed to 643 journals, 527 of those by regular subscription on account, 70 within an exchange agreement, and 46 were received as donations.

In order to substantially improve the acquisition of digital scientific literature by German universities, research centers and scientific libraries, the DFG started in 2004 to finance national licenses or so called "Alliance Licenses". Within this program of German national licenses the Institute has been able to provide further 5,500 electronic journals in addition to the 630 regular electronic subscriptions.

3.2.3. Book exhibition

The permanent book exhibition is an offer for interested scientific publishing houses to present their latest mathematical releases at the

am MFO über einen längeren Zeitraum zu präsentieren. Einige der wichtigsten Verlagshäuser weltweit beteiligen sich teilweise mit ihrem gesamten mathematischen Programm daran. Insgesamt gingen 788 Bücher von 19 verschiedenen Verlagen im Rahmen der Buchausstellung in den Bibliotheksbestand ein.

Institute over a longer period. Some of the most important publishing houses worldwide use this platform to present their program in mathematical sciences. Consequently 788 books from 19 different publishing houses have become part of the library's collection within the year 2016.

3.2.4. Fotosammlung

Das MFO verfügt über eine sehr große Sammlung an Mathematiker-Porträts, zusammengetragen durch Herrn Prof. Dr. Konrad Jacobs, Erlangen. Diese Sammlung ist im Jahr 2004 mit Hilfe des Springer Verlags Heidelberg digitalisiert worden; sie steht im Internet mit verschiedenen Recherche-Funktionen frei zur Verfügung. Die Sammlung ist auch im Jahr 2016 weiter angewachsen. Neben den 659 institutseigenen Fotos kamen weitere aus verschiedenen Quellen hinzu. Besonders erwähnen möchten wir an dieser Stelle Prof. George M. Bergman, der regelmäßig seine neuesten Aufnahmen für die Oberwolfacher Sammlung zur Verfügung stellt. Ende 2016 waren ca. 19.400 Fotos in der Datenbank enthalten.

3.2.4. Photo collection

The MFO owns a large photo-collection of mathematicians which is based on the collection of Prof. Dr. Konrad Jacobs, Erlangen. In 2004, the collection was digitalized with the help of Springer Verlag, Heidelberg, and since then has been freely available on the internet with several research functions. The collection has grown again in 2016. Apart from the 659 institute-own photos, further pictures have come from various sources. We want to give special recognition here to Prof. Greorge M. Bergman, who regularly provides his newest pictures for the Oberwolfach collection. By the end of 2016 the database listed approx. 19,400 photographs.

3.3. IT

Das MFO stellt den Mitarbeitern, den Gremien und den Gastwissenschaftlern eine effiziente IT-Infrastruktur zur Verfügung. Die Webangebote richten sich darüber hinaus an die mathematische Community. Die Leistungen umfassen:

3.3. IT

The MFO provides an efficient IT infrastructure for the employees, the scientific committee and the visiting scientists as well as web services for the mathematical community. This comprises the following services.

Tagungsverwaltungssoftware

Die am MFO entwickelte datenbankgestützte Software „owconf" vereinigt Anforderungen der wissenschaftlichen Verwaltung, der Tagungsverwaltung und der Hauswirtschaft. Die Wissenschaftliche Kommission und der Direktor begutachten die wissenschaftlichen Anträge mittels einer geschützten Weboberfläche. Organisatoren und Teilnehmer können ebenfalls über eine geschützte Weboberfläche vertrauliche Informationen zu ihren jeweiligen Veranstaltungen erhalten. „owconf" wird zur Optimierung der Arbeitsabläufe und zur Erfüllung der steigenden Ansprüche bei der statistischen Auswertung laufend weiterentwickelt.

Conference management software

The databased software "owconf" developed in-house handles all tasks arising from scientific mangement, conference management and guesthouse administration. This includes a protected web interface for the evaluation of scientific proposals through the members of the Scientific Committee and the Director. A protected web interface for the individual activities (Workshops, Mini-Workshops,...) offers additional information to the respective organizers and participants. Increasing demands for workflow optimisation and for reporting of statistical data require continuous developement of the "owconf" software.

Maildienste

Eine zuverlässige E-Mail-Kommunikation ist insbesondere für die Tagungsvorbereitung unverzichtbar. Das MFO betreibt daher eigene Maildienste. Besonderes Augenmerk gilt der hohen Verfügbarkeit, der Sicherung der E-Mails und der Spam- und Virenfilterung. Letzteres leistet der Dienst DFNMailSupport des Deutschen Forschungsnetzes.

Mail services

As a reliable e-mail communication is crucial especially for the prearrangement of the workshops, the MFO runs its own mail services. Special care is taken of high availability, e-mail backup and spam and virus filtering, the latter beeing provided by the DFNMailSupport service of the Internet provider "Deutsches Forschungsnetz".

Arbeitsumgebung der Mitarbeiter

Den Verwaltungsmitarbeitern stehen 16 Windows-Terminal-Server-Arbeitsplätze und eine Reihe von Laptops für den mobilen Einsatz zur Verfügung. Kommerzielle Software mit Serviceverträgen werden in den Bereichen Finanzbuchhaltung, Personalverwaltung, sowie bei Bibliothekskatalog und Literaturrecherche eingesetzt.

MFO staff working environment

Administrative staff has access to a total of 16 Windows Terminal Server workplaces and a number of laptops for mobile tasks. Commercial software with service contracts is used for financial accounting and human resources, for the library catalog and the literature search portal.

Arbeitsumgebung der Gastwissenschaftler

Die Gastwissenschaftler erhalten persönliche Nutzerkonten, drahtlosen und kabelgebundenen Internetzugang, SMTP-Server-Zugang sowie Scan- und Druckmöglichkeiten. Zehn Windows- und Linux-Terminal-Server-Arbeitsplätze bieten neben den üblichen Officeanwendungen Zugriff auf einen Computeserver mit Maple, Mathematica, Magma und einer Vielzahl freier mathematischer Software. Wegen der relativ kurzen Aufenthalte der Gäste sind die IT-Angebote so intuitiv wie möglich gestaltet. Alle Vortragsräume enthalten moderne Präsentationstechnik; den Gästen steht außerdem ein Videokonferenzsystem zur Verfügung. Die IT-Abteilung unterstützt die Gastforscher in allen technischen Fragen.

Guest scientists' working environment

Guest scientists are provided with personal accounts, wifi and cable-bound ethernet connection, SMTP server access and scan/print facilities. Ten Windows and Linux Terminal Server workplaces offer the usual office tools together with access to a compute server with Maple, Mathematica, Magma and a range of free mathematical software. Due to the relativly short stays of the guest scientists, the services are designed as easy to use as possible. The IT section maintains modern presentation equipment in all lecture rooms, a video conference system and offers technical support to guest researchers on all technical issues.

Webdienste

Die Webdienste für die Gastwissenschaftler und die weitere mathematische Community bieten Informationen über die Angebote des MFO, künftige und vergangene Forschungsprogramme und – in Zusammenarbeit mit der Bibliothek – freien Zugang zu allen Publikationen des Instituts. Die speziellen Webdienste Oberwolfach Photo Collection und Oberwolfach References on Mathematical Software sind Eigenentwicklungen des MFO.

Web services

Web services for the guest scientists and the wider mathematical community include information about MFO facilities, future and past research programs at the MFO and open access to all publications of the Institute in collaboration with the MFO library. The special web services Oberwolfach Photo Collection and Oberwolfach References on Mathematical Software have been developed in-house.

Unterstützung der Öffentlichkeitsarbeit

Die IT-Abteilung unterstützt auch die Plattform IMAGINARY, insbesondere die „Schnappschüsse moderner Mathematik aus Oberwolfach", für deren Produktion sie die IT-Infrastruktur bereitstellt. Desweiteren betreut die IT des MFO das Oberwolfacher Museum für Mineralien und Mathematik „MiMa". Dieses wird von der Gemeinde Oberwolfach, dem Verein der Freunde von Mineralien und Bergbau Oberwolfach und dem MFO gemeinsam betrieben; im mathematischen Teil sind interaktive Exponate der preisgekrönten Wanderausstellung IMAGINARY dauerhaft zu sehen. Für die mathematischen und mineralogischen Vorträge und die kulturellen Veranstaltungen erhielt das MiMa 2016 eine fest installierte Vortragsausstattung.

Support of outreach activities

The IT section also supports the outreach platform IMAGINARY, in particular it supplies the IT infrastructure for producing the "Snapshots of Modern Mathematics from Oberwolfach". Moreover the IT section services the Museum for Minerals and Mathematics "MiMa". It is run jointly by the local authority, the association of the Friends of Minerals and Mining and the MFO – all seated at Oberwolfach. The maths section of the MiMa hosts interactive exhibits of the awardwinning exhibition IMAGINARY. For mathematical and mineralogical lectures as well as cultural events the MiMa was equipped in 2016 with a permanently installed technical facility.

Entwicklung und Support

Die IT-Abteilung bietet zu allen Diensten umfangreichen Support. Der technische Fortschritt mit kurzen Lebenszyklen und auf 3 bis 5 Jahre begrenzten Wartungsverträgen erzeugt einen hohen Modernisierungsdruck. Dies erfordert einen vollständigen Austausch der Hardware (Server, PCs, Peripheriegeräte, aktive Netzwerkkomponenten) und der Software (Betriebssysteme, Anwendungen) innerhalb von 6 bis 8 Jahren. Darüber hinaus unterliegen Funktionsweise und -umfang der genannten Dienste aufgrund zunehmender Anforderungen einer ständigen Weiterentwicklung.

2016 wurde die Hälfte des Festplattenspeichers ersetzt und ein Fünftel der Server neu aufgesetzt.

Sicherheit und Datenschutz

Informationssicherheit und Datenschutz sind wichtige Aufgaben der IT, die bei allen Arbeiten mit bedacht werden. Zu den Kernpunkten gehören:

- Firewall, Softwareupdates, Virenscanner
- redundanter Netzwerkaufbau mit zwei separat funktionsfähigen Serverräumen
- mehrstufiges, räumlich verteiltes Backup
- Serviceverträge für unternehmenskritische Hard- und Software
- Bezug der einschlägigen Sicherheitsnachrichten
- Sensibilisierung der Nutzer und Fortbildung des IT-Personals

2016 gab es wie in den Vorjahren keine nennenswerten Sicherheitsvorfälle.

Ressourcen

Die IT-Abteilung ist personell mit zwei Vollzeitstellen ausgestattet. Wesentliche Merkmale der Hardwareausstattung sind:

- 2 Serverräume mit 4 physikalischen Servern, 2 Storages und 25 virtuellen Servern
- Gigabit-LAN, verteilt über 3 Gebäude mit 170 Anschlüssen und 26 WLAN Access Points
- redundante Internetanbindung mit zwei 100-Mbis/s-Standleitungen des Deutschen Forschungsnetzes (DFN)

Development and support

Extensive support for the above-mentioned services is understood. Technical progress with short life cycles and service contracts for at most 3 to 5 years result in a constant need for modernisation. Hardware (servers, PCs, peripheral and network devices) and software (operating systems, applications) is beeing completely replaced within a period of 6 to 8 years. Due to increasing demands regarding functionality and scope the above-mentioned services are subject to continuous development.

In 2016 half of the storage was replaced and one fifth of the servers newly installed.

Security and data protection

Data security and data protection are important tasks, taken into account throughout. Central points are:

- firewall, software updates, virus scanners
- redundant network setup with two server rooms each of which can be dispensed
- multi-step backup system with distributed storage
- service contracts for critical hard- and software
- subscription of relevant security news
- awareness raising of users, advanced training of IT personnel

There were no relevant security breaches in 2016 as well as in the preceeding years.

Resources

Two fulltime positions are assigned to the IT section. The hardware resources include:

- 2 server rooms comprising 4 physical servers, 2 storages and 25 virtual servers
- Local Area Network on Gigabit Ethernet basis distributed over 3 buildings with 170 data links and 26 wifi access points
- redundant Internet connection via the Deutsches Forschungsnetz (DFN) with two 100 Mbit/s leased lines

Die Verwendung freier und kommerzieller Software steht sowohl bei den Betriebssystemen als auch bei den Anwendungen in einem ausgewogenen Verhältnis. Während die kommerzielle Software bei den PCs und Anwendungen überwiegt, wird auf Serverseite Open-Source-Software wegen ihrer Flexibilität und besseren Handhabbarkeit vorgezogen.

Größere Arbeiten im Jahr 2016

In den letzten Jahren zeigte sich sowohl im Verwaltungsbereich als auch bei den Gastwissenschaftlern die Notwendigkeit einer professionellen Videokonferenzanlage. 2015 konnte das Institut im Rahmen des von der VolkswagenStiftung finanzierten Projekts „Modernisierung der Informations- und Kommunikationsinfrastruktur des Mathematischen Forschungsinstituts Oberwolfach" eine sehr flexible Lösung anschaffen. Sie wurde im Januar 2016 in Betrieb genommen und wird seitdem von Gästen und Institutsangehörigen regelmäßig genutzt.

Die Ausgründung von IMAGINARY als eigene gGmbH mit Sitz in Berlin wurde im September 2016 vollzogen. Dies erforderte im IT-Bereich technische, organisatorische und rechtliche Änderungen. Die laufende Betreuung des mathematischen Teils des MiMa einschließlich des Webauftritts erfolgt nun allein durch das MFO. Die Planung und Umsetzung neuer Exponate liegt bei IMAGINARY.

Der Bereich Kopieren - Drucken - Scannen - Faxen wurde modernisiert und vereinheitlicht. Dabei wurde das Angebot erweitert und der Wartungsaufwand reduziert.

Die WLAN-Abdeckung der Gebäude und Freiflächen wurde weiter verbessert und auf alle Gästezimmer und Arbeitsräume ausgedehnt.

3.4. Verwaltung und Hauswirtschaft

Aufgrund der Beschlüsse der Gemeinsamen Wissenschaftskonferenz (GWK) erstellt das MFO als Mitglied der Leibniz-Gemeinschaft seit dem Haushaltsjahr 2006 ein Programmbudget als Grundlage für die gemeinsame Finanzierung durch Bund und Länder.

Das Tagungsgebäude liegt dem Gästehaus direkt gegenüber und wurde mit Mitteln der VolkswagenStiftung erbaut. Es bietet den Forschungsgästen exzellente Arbeitsmöglichkeiten und umfasst die Bibliothek, mehrere Vortragsräume sowie Computerarbeitsplätze. Ferner ist

The use of free and commercial software is balanced at the level of both operating systems and applications. While commerical software is dominant at the PCs and user applications, open source software is preferred on the server side for its flexibility and manageability.

Major Activities in 2016

The need for a professional video conferencing system has become evident over the last years both for administrative purposes and for the guest scientists. In 2015 the Institute was able to aquire a highly flexible video conferencing system as part of the project "Modernisierung der Informations- und Kommunikationsinfrastruktur des Mathematischen Forschungsinstituts Oberwolfach" financed by the Volkswagen Foundation. It was taken into operation in January 2016 and from the start has been used frequently by the guests and by the employees.

The hive-down of IMAGINARY as a limited liability company with headquarters in Berlin took place in September 2016. For the IT, this involved technical, organizational and legal adaptions. The MFO is now the sole support of the mathematical exibition of the MiMa, including the website. IMAGINARY is still responsible for the planning and realization of new exhibits.

The sector copying - printing - scanning - faxing has now been modernized and standardized, reducing maintanance costs and expanding the range of services at the same time.

WiFi-coverage in the buildings and outside areas was further improved and extended to all guestrooms and working areas.

3.4. Administration and housekeeping

According to the resolution of the Joint Science Conference (Gemeinsame Wissenschaftskonferenz GWK), the MFO as a member of the Leibniz-Gemeinschaft, has established a budget-plan since 2006 as a basis for the common financing by the federation of Germany and the federal states.

The library building is located immediately opposite the guest house and was built with funds from the Volkswagen Foundation. Hosting the library, several lecture halls and numerous computer stations it offers excellent working conditions for scientific research. The offices of the

die wissenschaftliche Verwaltung dort untergebracht. Im Mai 2007 konnte der Erweiterungsbau der Bibliothek, finanziert von der Klaus Tschira Stiftung und der VolkswagenStiftung, feierlich eingeweiht werden. Die Nähe von Tagungsgebäude und Gästehaus erweist sich als sehr effizient, bietet sie den Wissenschaftlern doch rund um die Uhr die Möglichkeit zu kreativer Arbeit, was intensiv genutzt wird. Im Frühjahr 2010 wurde die Sanierung des Gästehauses abgeschlossen.

Der Verwaltungsbereich umfasst derzeit 12,70 besetzte Stellen für die wissenschaftliche Verwaltung (Organisation der Workshops, Öffentlichkeitsarbeit, Drittmittelprojekte), die Bibliothek, die IT sowie für die allgemeine Verwaltung (Finanzverwaltung, Beschaffungswesen, Personalsachbearbeitung, Vertragswesen, usw.) und die Gästebetreuung.

Der Hauswirtschaftsbereich des Instituts unterstützt die Durchführung der wissenschaftlichen Programme, indem die Gastforscher im Gästehaus des Instituts Unterkunft und Verpflegung erhalten. Das Gästehaus wurde mit Mitteln der VolkswagenStiftung erbaut und 1967 eingeweiht. Die Wissenschaftler sind überwiegend in Einzelzimmern untergebracht, jedoch gibt es auch 8 größere Appartements sowie 5 Bungalows. Dadurch sind auch längere Aufenthalte im Rahmen des RiP-Programms und des Oberwolfach-Leibniz-Fellows-Programms möglich. Der Hauswirtschaftsbereich umfasst insgesamt 13 Stellen für Küche und Zimmerservice sowie für die Pflege von Gebäuden und Grundstück.

scientific administration are also part of this building. The extension of the library, funded by the Klaus Tschira Stiftung and the Volkswagen Foundation was ceremonially inaugurated in may 2007. The short distance between the guest house and the library building has proofed very convenient as it offers scientists the possibility to work at any time, which is used extensively. Since spring 2010 the renovation measures in the guest house have been terminated.

The administration encompasses at the moment 12.70 positions, covering scientific administration (planning and organization of the scientific program, public relations, third-party projects), library, IT-services and general administration (financial management, purchasing, personnel administration, contracts, renovation measures etc.) as well as guest liaison and support.

Since board and lodging is provided by the Institute, housekeeping is also an important part of the realization of the scientific program at the MFO. The guest house was built with funds from the Volkswagen Foundation and inaugurated in 1967. Accommodation of the scientists is mainly provided in single rooms. In addition to that, 8 apartments and 5 bungalows enable a longer stay at the MFO within the Research in Pairs program and the Oberwolfach Leibniz Fellows program. The housekeeping department comprises 13 positions for kitchen and room service as well as for the maintenance of the buildings and premises.

3.5. Finanzielle Übersicht

3.5. Financial overview

Erlöse 2016	**Revenues 2016**	
(gerundet auf 1.000 €)	(rounded)	
Zuwendung Bund/Länder	Benefits from the federation/ federal states	3.114.000
Drittmittel	Third party funds	522.000
Spenden	Donations	80.000
sonstige Einnahmen	Other income	218.000
zweckgebundene Reste aus 2015	Earmarked surpluses	1.065.000
Summe Erlöse	**Total revenues:**	**4.999.000**

Aufwendungen 2016	**Expenses 2016**	
(gerundet auf volle 1.000 €)	(rounded)	
Personalausgaben	Personnel department	1.674.000
Materialaufwand	Purchases	371.000
Aufwand für bezogene Leistungen	Expenses for drawn benefits	268.000
Abschreibungen	Consumption of fixed capital	98.000
sonstige Aufwendungen (inklusive Sachausgaben Bibliothek)	Other Expenses (with material expenses for the library)	2.061.000
Rückstellungen für zweckgebundene Reste	Provisions for earmarked surpluses	414.000
Investitionen	Investments	113.000
Summe Aufwendungen	**Total expenses:**	**4.999.000**

Erläuterungen

Die Drittmittel wurden dem Haushaltsjahr zugerechnet, für das sie zugewiesen wurden.

Der Anteil von Drittmitteln, Spenden und sonstigen Einnahmen bezogen auf die Gesamtsumme der Erlöse liegt im Haushaltsjahr 2016 bei 21,5%. Die zweckgebundenen Reste aus 2015 sind dabei nicht berücksichtigt.

Öffentliche Mittel

Das MFO erhielt im Haushaltsjahr 2016 insgesamt 3,114 Mio. Euro Zuwendung von Bund und Ländern.

Drittmittel

Die projektbezogenen Drittmittel rekrutierten sich im Haushaltsjahr 2016 insbesondere aus Mitteln der National Science Foundation (NSF), der Simons Foundation, der Carl Friedrich von Siemens Stiftung, der Klaus Tschira Stiftung und der VolkswagenStiftung.

Förderverein und Oberwolfach Stiftung

Zweckgebundene Spenden erhielt das MFO auch im Haushaltsjahr 2016 vom Förderverein und der Oberwolfach Stiftung. Die Gelder wurden für Reisekostenzuschüsse in besonderen Fällen und als Zuschuss zu Baumaßnahmen verwendet.

3.6. Dank

Ein besonders herzliches Dankeschön gilt den Zuwendungsgebern (Bund und Länder). Weiter gilt unser Dank allen Drittmittelgebern wie der Klaus Tschira Stiftung, der Carl Friedrich von Siemens Stiftung, der National Science Foundation (NSF), der Simons Foundation und der VolkswagenStiftung. Ein besonderes Dankeschön gilt natürlich auch dem Förderverein und der Oberwolfach Stiftung für die großzügige Unterstützung des MFO.

Explanations

The third party funds were attributed to the fiscal year they were assigned to.

The proportion of private resources (own income, third-party-funds and donations) of the total sum of revenues is 21,5%. Funds carried forward from 2015 are disregarded here.

Public funding

In the fiscal year 2016 the MFO received 3.114 million Euro funding from the federation and the federal states.

Third-party funds

Earmarked third party funds in the fiscal year 2016 are mainly composed of the grants from the National Science Foundation (NSF), the Simons Foundation, the Carl Friedrich von Siemens Foundation, the Klaus Tschira Stiftung and the Volkswagen Foundation.

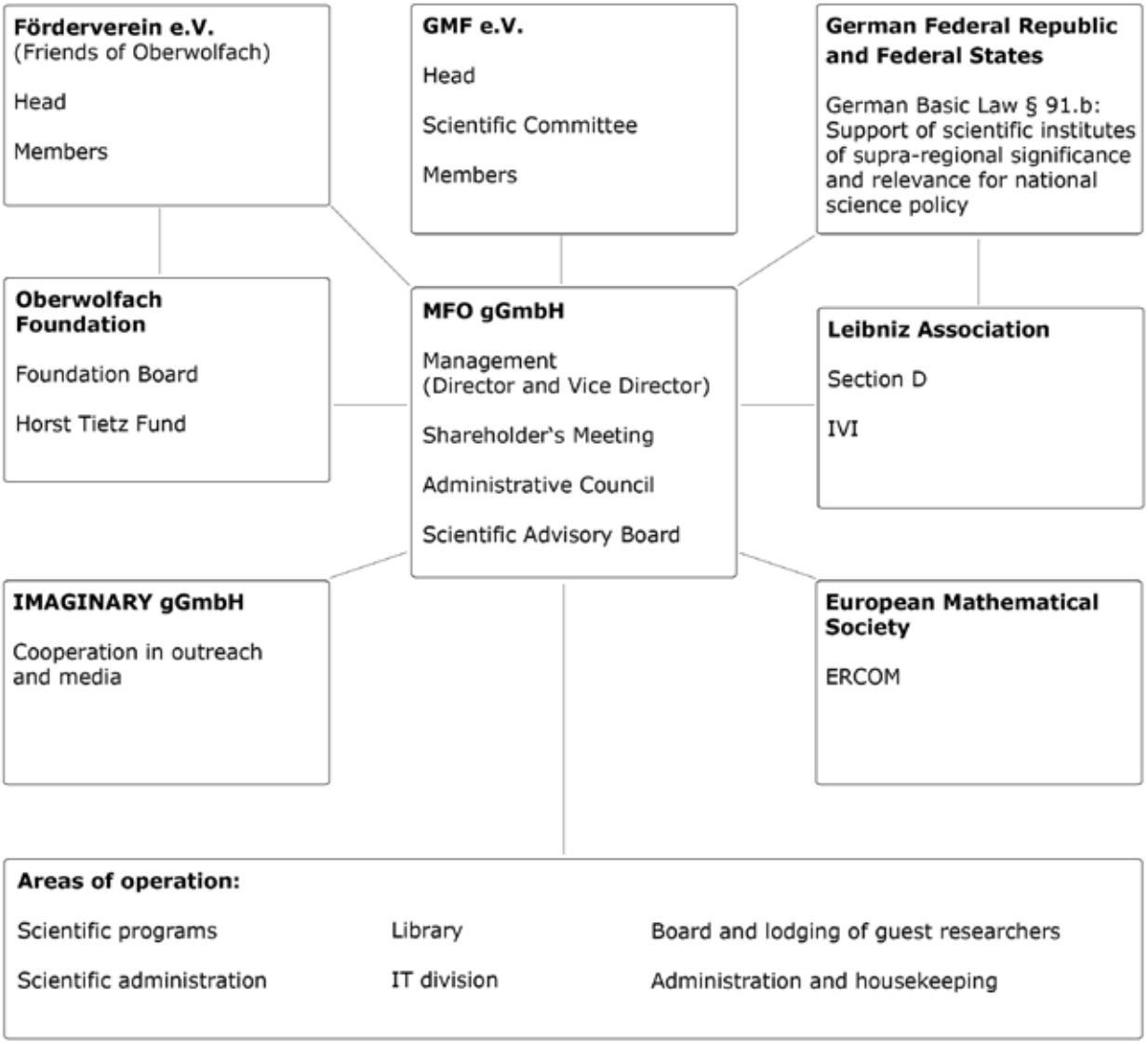
Förderverein and Oberwolfach Foundation

Earmarked donations have been received by the Förderverein and the Oberwolfach Foundation. These funds have been used to support travel costs for scientists in special cases and as additional support for building measures.

3.6. Acknowledgement

A particular thank-you goes to the federation and the federal states for their financial support. We would also like to thank for the third-party funds received from the Klaus Tschira Stiftung, the Carl Friedrich von Siemens Stiftung, the National Science Foundation (NSF), the Simons Foundation and the Volkswagen Foundation. Our special thank-you also goes to the Förderverein and the Oberwolfach Foundation for their important support of the MFO.

3.7. Organigramm



Erläuterungen

Das Mathematische Forschungsinstitut Oberwolfach (MFO) ist seit April 2005 eine gemeinnützige GmbH. Die Geschäftsführung des MFO besteht aus Direktor und stellvertretendem Direktor. Alleiniger Gesellschafter des MFO ist die Gesellschaft für Mathematische Forschung e.V. (GMF), die durch ihren Vorstand vertreten wird. Das MFO wird von der Bundesrepublik Deutschland und den Bundesländern im Rahmen der Forschungsförderung nach Artikel 91b des Grundgesetzes gemeinschaftlich finanziert, wobei das Sitzland Baden-Württemberg eine besondere Rolle einnimmt. Dabei ist die Mitgliedschaft des MFO in der Leibniz-Gemeinschaft Bestandteil der gemeinschaftlichen Finanzierung. Die Zuwendungsgeber sind im Verwaltungsrat des MFO vertreten, der als wichtigstes Aufsichtsgremium

Explanations

Since April 2005 the Mathematisches Forschungsinstitut Oberwolfach has been registered as a non-profit corporation (gemeinnützige GmbH). The MFO is headed by a Director supported by a Vice Director. The sole associate of the MFO is the Gesellschaft für Mathematische Forschung e.v. (GMF), represented by its board. Financing of the MFO is shared by the Federal Republic of Germany and the Federal States according to article 91b (research financing) of the Basic Law of the Federal Republic of Germany with emphasis on the local state of Baden-Württemberg. Being a member of the Leibniz Association is a prerequisite for the common financing. The financial partners are represented in the Administrative Council (Verwaltungsrat) of the MFO, which in its function as most important supervisory panel

über die mittel- und langfristige Finanz- und Budgetplanung entscheidet. Institut und Verwaltungsrat werden dabei vom wissenschaftlichen Beirat des MFO beraten, dem 6 bis 8 international angesehene Mathematiker angehören. Ferner ist das MFO Mitglied in ERCOM (European Research Centres on Mathematics), einem Komitee der European Mathematical Society.

decides on the medium- and long-term finance- and budget planning. The Institute and the Administrative Council are supported by the Scientific Advisory Board (wissenschaftlicher Beirat) which is composed of 6 to 8 internationally renowned mathematicians. Moreover, the MFO is a member of ERCOM (European Research Centres on Mathematics), a committee of the European Mathematical Society.

Die Gesellschaft für Mathematische Forschung e.V. (GMF) hat ca. 80 Mitglieder, darunter die vier institutionellen Mitglieder DMV (Deutsche Mathematiker-Vereinigung), GAMM (Gesellschaft für angewandte Mathematik und Mechanik), EMS (European Mathematical Society) und Förderverein. Die GMF ist Eigentümer des Grundstücks und der Institutsgebäude des MFO. Der Vorstand der GMF besteht aus dem Vorstandsvorsitzenden, dem Schatzmeister und dem Vorsitzenden der wissenschaftlichen Kommission. Die wissenschaftliche Kommission der GMF besteht aus ca. 20 - 25 international angesehenen Mathematikern und ist in Abstimmung mit der Geschäftsführung des MFO zuständig für die Forschungs- und Entwicklungsplanung sowie die aktuelle wissenschaftliche Arbeitsplanung des MFO.

The Gesellschaft für Mathematische Forschung e.V. (GMF) consists of about 80 members, including four institutional members, namely DMV (Deutsche Mathematiker-Vereinigung), GAMM (Gesellschaft für angewandte Mathematik und Mechanik), EMS (European Mathematical Society) and the Förderverein. The GMF is the legal owner of the site and of the buildings of the MFO, and the head of the society is formed by the chairman, the treasurer, and the chairman of the Scientific Committee. The Scientific Committee of the GMF is composed of about 20 to 25 internationally renowned mathematicians and is responsible for the research and development planning, as well as for running decisions on scientific proposals, in agreement with the head of the MFO.

Der Verein zur Förderung des Mathematischen Forschungsinstituts Oberwolfach e.V. (Förderverein) hat etwa 600 Mitglieder, die das MFO durch Mitgliedsbeiträge zusätzlich finanziell unterstützen. Die Oberwolfach Stiftung, die im Förderverein als nicht rechtsfähige Stiftung gegründet wurde, sammelt Stiftungskapital aus dem wirtschaftlichen und dem privaten Bereich. Dabei spielt der Horst Tietz Fund als Sondervermögen innerhalb der Oberwolfach Stiftung eine besondere Rolle. Die Erträge des Stiftungskapitals kommen dem MFO zu Gute.

The Verein zur Förderung des Mathematischen Forschungsinstituts Oberwolfach e.V. (Förderverein) has about 600 members and provides additional financial support for the MFO by its membership fees. The Oberwolfach Foundation (Oberwolfach Stiftung), a foundation of public utility within the Förderverein, provides further financial support by economic and private means. Within the Oberwolfach Stiftung the Horst Tietz Fund plays an important role by providing special funds.

Das Institut ist außerdem Gesellschafter der IMAGINARY gGmbH und kooperiert mit dieser im Bereich der Öffentlichkeitsarbeit. IMAGINARY begann als Projekt des MFO im Jahr 2008 und wurde 2016 als selbständiger Dienstleister im Bereich der Mathematik-Kommunikation ausgegründet.

Furthermore the Institute is a shareholder of the IMAGINARY gGmbH and cooperates with the company in the field of public relations. IMAGINARY started in 2008 as a project of the MFO. Since 2016 it is an independent service provider in the field of mathematics communication.

Wissenschaftliche Verwaltung	**Scientific Administration**	
Direktor	Director	Prof. Dr. Gerhard Huisken
Stellvertretender Direktor	Vice Director	Prof. Dr. Dietmar Kröner
Wissenschaftlicher Administrator	Scientific Administrator	apl. Prof. Dr. Stephan Klaus
Wissenschaftliche Mitarbeiterin	Scientific Assistant	Dr. Tatjana Ruf
Wissenschaftliche Mitarbeiter im Projekt IMAGINARY	Scientific Assistants in the project IMAGINARY	Dr. Andreas Daniel Matt, Dr. Christian Stussak, Bianca Violet, Dr. Antonia Mey Carina Geldhauser
Sekretärinnen für Workshops, RiP und Seminare	Secretaries for Workshops, RiP and Seminars	Silke Okon, Andrea Schillinger
Verwaltung	**Administration**	
Verwaltungsleitung	Head of Administration	Susanne Riester
Sekretärinnen im Gästebüro	Secretaries in the guest services office	Annette Disch, Petra Lein, Katrin Schmid
Bibliothekarin	Librarian	Verena Franke
Assistentinnen der Bibliothek	Library Assistants	Jennifer Hinneburg, Gisela Lehmann
Systemverwalter	System Administrators	Helmut Kastenholz, Christoph Weber
Hauswirtschaft	**Housekeeping**	
Hauswirtschaftsleiterin	Housekeeping Manager	Charlotte Endres
Hausmeister	Caretaker	Helmut Breithaupt
Weitere Beschäftigte	Further Housekeeping Staff	11 full time equivalent

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(Mitglieder/Members 2016)

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Prof. Dr. Friedrich Götze	Fakultät für Mathematik, Universität Bielefeld
Prof. Dr. Wolfgang Lück	Director of HIM (Hausdorff Institute for Mathematics), Mathematisches Institut Universität Bonn
Christian Mees	Staatskanzlei des Saarlandes
Prof. Dr. Felix Otto	Direktor des Max-Plancks-Instituts für Mathematik in den Naturwissenschaften, Leipzig
Beate Spiegel	Geschäftsführerin der Klaus Tschira Stiftung gGmbH, Heidelberg
Dr. Indra Willms-Hoff	VolkswagenStiftung, Hannover
Prof. Dr. Günter Ziegler	Institut für Mathematik, Freie Universität Berlin

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Gesellschaft für Mathematische Forschung e.V. (GMF)

Vorstand der GMF/Head of the GMF
(Mitglieder/Members 2016)

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Prof. Dr. Felix Otto, MIS Leipzig/ Prof. Dr. Günter Ziegler, FU Berlin	Vorsitzender der Wissenschaftlichen Kommission/ Chair of the Scientific Committee
Prof. Dr. Joachim Schwermer, Wien	Schatzmeister/Treasurer

Wissenschaftliche Kommission der GMF/Scientific Committee of the GMF
(Mitglieder/Members 2016)

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Prof. Dr. Felix Otto, MIS Leipzig (Chair since October 2016)
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