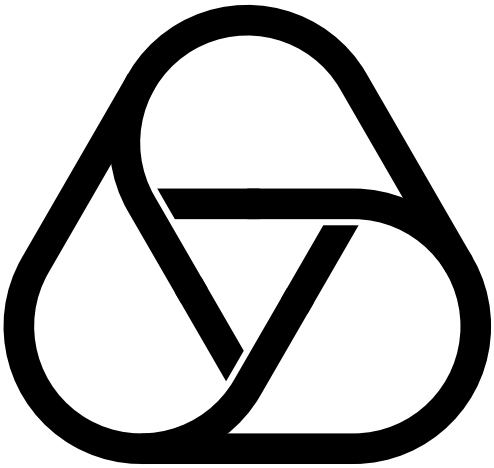
Oberwolfach

Jahresbericht
Annual Report
2009



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Mathematisches Forschungsinstitut Oberwolfach

Direktor
Gert-Martin Greuel

Gesellschafter
Gesellschaft für Mathematische Forschung e.V.

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

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

Das Mathematische Forschungsinstitut Oberwolfach ist Mitglied der Leibniz-Gemeinschaft.

JAHRESBERICHT 2009 / ANNUAL REPORT 2009

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Die männliche Form wurde lediglich aus Gründen der Vereinfachung gewählt und dient der besseren Lesbarkeit. Entsprechende Begriffe gelten im Sinne der Gleichbehandlung grundsätzlich für Frauen und Männer.

Vorwort des Direktors

Der Jahresbericht 2009 gibt Ihnen einen Überblick über die wissenschaftlichen Programme des MFO, die sachlichen und finanziellen Rahmenbedingungen und nicht zuletzt über die nicht-wissenschaftlichen Aktivitäten, die mittlerweile einen erheblichen Teil der Arbeitszeit der Mitarbeiter und der Leitung des Instituts beanspruchen. Ich gebe im Folgenden einen kurzen Überblick über das wissenschaftliche Programm, die durchgeführten Baumaßnahmen, die Evaluierung durch die Leibniz Gemeinschaft, die Öffentlichkeitsarbeit und über sonstige wichtige Projekte des MFO.

Das wissenschaftliche Programm mit seinen sechs Komponenten:

1. Workshops
2. Miniworkshops (4 Wochen, je 3 Miniworkshops)
3. Research in Pairs Programm („RiP", kontinuierlich)
4. Arbeitsgemeinschaft Deninger – Faltings (2 Wochen)
5. Oberwolfach Seminare (3 Wochen, je 2 Seminare)
6. Oberwolfach Leibniz Fellows (OWLF, kontinuierlich)

läuft sehr gut. Die Nachfrage übersteigt bei allen Komponenten die Kapazität deutlich, und die wissenschaftliche Qualität ist hervorragend. Detaillierte Informationen finden Sie im Abschnitt 2, dem Hauptteil des Jahresberichts. Den immer aktualisierten Stand finden Sie auf unserer Webseite www.mfo.de.

Die öffentliche Oberwolfach Vorlesung findet jedes Jahr im Oktober während der Jahresversammlung der Gesellschaft für Mathematische Forschung statt. Im Berichtsjahr wurde sie von Prof. Dr. Dr. h. c. mult. Friedrich Hirzebruch gehalten und hatte den Titel „Chern Characteristic Classes in Topology and Algebraic Geometry". Ich danke Herrn Hirzebruch sehr herzlich für seinen Vortrag und für die Ausarbeitung, die wir in diesem Band abdrucken.

Neben dem wissenschaftlichen Programm hat uns 2009 ein großes Vorhaben beschäftigt: Die

Director's Foreword

The 2009 Annual Report gives detailed information on the scientific programme of the MFO, its factual and financial framework, and its non-scientific activities which demand increasing attention from the Institute's staff and management. In the following I will give you a short survey on the scientific programme, the renovation measures, the Institute's evaluation by the Leibniz Gemeinschaft, the PR activities, and other important projects.

The scientific programme with its six components:

1. Workshops
2. Mini-Workshops (4 weeks, 3 Mini-Workshops per week)
3. Research-in-Pairs 'RiP' (continously)
4. Arbeitsgemeinschaft Deninger-Faltings (2 weeks)
5. Oberwolfach Seminars (3 weeks, 2 seminars per week)
6. Oberwolfach Leibniz Fellows (OWLF, continously)

is running with great success. The demand in all six components greatly exceeds our capacity and the scientific quality is outstanding. You will find detailed information on our scientific programme in paragraph 2, which comprises the principal part of this Annual Report. The up-to-date status can be found on our homepage www.mfo.de.

The public Oberwolfach Lecture takes place every October, on the occasion of the annual meeting of the Gesellschaft für Mathematische Forschung. The 2009 lecture 'Chern Characteristic Classes in Topology and Algebraic Geometry' was given by Prof. Dr. Dr. h. c. mult. Friedrich Hirzebruch. I would like to express my sincerest thanks to Professor Hirzebruch for his lecture and for the accompanying article which will be printed in this Annual Report.

Besides the scientific programme a major project kept us busy in 2009: the overall refurbishment

Generalsanierung des Gästehauses, inklusive Brandschutzsanierung und Techniksanierung. Die Arbeiten fanden während des laufenden Betriebs statt und führten zum Teil zu stärkeren Behinderungen, speziell für die Hauswirtschaft. Das wissenschaftliche Programm konnte aber ohne nennenswerte Einschränkungen und nur mit minimaler Reduzierung der Teilnehmerzahl durchgeführt werden. Die Maßnahmen wurden im Frühjahr 2010 abgeschlossen und ich werde im Jahresbericht 2010 ausführlich darüber berichten.

of the guest house, including fire protection and technical systems. These measures were carried out alongside the daily routine and partially led to considerable constraints, particularly for our housekeeping department. However the scientific programme ran without noteworthy restrictions and only the number of participants had to be slightly reduced. The measures were finished in spring 2010 and I will report on this in more detail in the 2010 Annual Report.

Die Ausstellung „IMAGINARY- Mit den Augen der Mathematik" wird weiter stark nachgefragt. Auch 2009 war IMAGINARY in einigen Städten zu sehen, darunter in Wien, Berkeley, Stanford, Dresden, Bonn und Münster sowie in Kiew, im Beisein des Deutschen Botschafters aus Anlass des 150. Todestages von Alexander von Humboldt.

The exhibition 'Imaginary – With the Eyes of Mathematics' is still in great demand. The exhibition has been presented in many cities, for example Vienna, Berkeley, Stanford, Dresden, Bonn, and Münster, and also in Kiev, with the German Ambassador being present on occasion of the 150th anniversary of the death of Alexander von Humboldt.

Mit seinem Projekt IMAGINARY wurde das MFO von der Initiative „365 Orte – Deutschland, Land der Ideen" unter der Schirmherrschaft des Bundespräsidenten zum Ort der Ideen 2009 gewählt. Aus diesem Anlass fand am 23.09.2009 eine Feier im Oberwolfacher Museum für Mineralien und Mathematik „MiMa" statt, auf der die Verwaltungsratsmitglieder Frau Tania Bolius (MWK Baden-Württemberg), Frau Dr. Heike Prasse (BMBF) und Herr Dr. h.c. Klaus Tschira (Klaus Tschira Stiftung) Grußworte gehalten haben, wofür ich ihnen herzlich danke. Weitere Einzelheiten finden Sie im Inneren dieses Berichts. Das MiMa wurde am 30.01.2010 feierlich eröffnet, aber darüber werde ich im nächsten Jahr berichten.

For its project IMAGINARY the MFO was chosen as a 'Selected Landmark 2009 in the Land of Ideas' by the 'Germany – Land of Ideas' initiative under the patronage of the President of the Federal Republic of Germany. On September 23, 2009 a ceremony took place at the Museum of Minerals and Mathematics (MiMa) with a welcome from the members of the MFO's Administrative Council, namely Ms Tania Bolius (Ministry of Science and Culture of the Land of Baden-Württemberg), Dr. Heike Prasse (Federal Ministry of Education and Research), and Dr. h.c. Klaus Tschira (Klaus Tschira Foundation). I would like to offer them all my sincere thanks. The opening ceremony of the Museum of Minerals and Mathematics took place on January 30, 2010 but this will be part of our next year's annual report.

Erfreulich ist, dass wir für unsere wissenschaftlichen Programme eine weitere Nachwuchsförderung etablieren konnten, das "Oberwolfach Leibniz Graduate Students-Programm". Das von der Leibniz Gemeinschaft im Rahmen des Wettbewerbsverfahrens zum Pakt für Forschung und Innovation bewilligte Projekt zur Förderung von ca. 5 herausragenden Doktoranden in jedem Oberwolfach Workshop, läuft seit Januar 2009 sehr erfolgreich. Die Förderung durch die Leibniz Gemeinschaft ist zunächst bis Ende 2011 gesichert und betrifft insbesondere Reisekostenunterstützung für die Doktoranden. Wir hoffen, dass diese Förderung des wissenschaftlichen Nachwuchses auf Dauer gesichert werden kann.

To our great pleasure we have succeeded in establishing a further project promoting young researchers called 'Oberwolfach Leibniz Graduate Students'. This project has been approved by the Leibniz Gemeinschaft within the Joint Initiative for Research and Innovations and aims at the promotion of about 5 excellent doctoral students in each Oberwolfach Workshop. Since January 2009 this project has been running very successfully and comprises primarily travel support for doctoral students. The funding by the Leibniz Gemeinschaft is guaranteed to the end of 2011 and we sincerely hope that the promotion of young researchers can be ensured in the long term.

Das von der DFG geförderte Projekt ‚Oberwolfach Digital Archive' (ODA) zusammen mit dem Mathematikhistoriker PD Dr. Volker Remmert schreitet gut voran. Sämtliche alten

The project Oberwolfach Digital Archive (ODA) which is supported by the DFG and implemented in co-operation with the mathematician and historian Dr. Volker Remmert is progressing

Tagungsberichte und Vortragsbücher sind inzwischen digitalisiert und werden später online der Öffentlichkeit zugänglich gemacht.

Die Leibniz Gemeinschaft evaluiert jedes Institut im 7-jährigen Rhythmus. Das MFO wurde am 18.03.2009 evaluiert, was mit umfangreichen Vorbereitungen verbunden war. Die Stellungnahme des Senats der Leibniz-Gemeinschaft ist außerordentlich positiv und schließt mit einer uneingeschränkten Förderempfehlung für die nächsten 7 Jahre. Im Abschnitt 1.1 dieses Jahresberichts finden Sie einen ausführlichen Bericht zur Evaluierung.

Abschließend ein herzlicher Dank an alle, die das Institut auch 2009 mit Rat und Tat und mit finanziellen Mitteln unterstützt haben. In Abschnitt 3.6. finden Sie eine detaillierte Darstellung dieser Unterstützung. Ein besonderer Dank geht wieder an die Mitarbeiterinnen und Mitarbeiter des Instituts, den Verwaltungsrat, den wissenschaftlichen Beirat und die wissenschaftliche Kommission, die mit Urteilskraft, Umsicht und persönlichem Engagement ganz wesentlich zum Erfolg des Instituts beigetragen haben.

well. In the meantime all former workshop reports and lecture books have been digitised. The public will be given online access to these documents at a later date.

Each Institute of the Leibniz Gemeinschaft is evaluated every 7 years. The MFO's evaluation took place on March 18, 2009 and required considerable preparation. The assessment of the Senate of the Leibniz Gemeinschaft was very positive and includes an unrestricted recommendation for the funding of the Institute for a further period of seven years. You will find a detailed report on the evaluation in paragraph 1.1 of this Annual Report.

Finally, I would like to thank all those who have supported the Institute in 2009 in word and deed and with financial means: in paragraph 3.6 you will find detailed information on the support received. My special thanks go to the staff of the Institute, to the members of the Administrative Council, of the Scientific Advisory Board, and of the Scientific Committee, who have all contributed considerably to the success of the Institute through their judgement, prudence, and personal commitment.

Gert-Martin Greuel

1. Besondere Beiträge

1.1. Evaluierung

Das MFO wurde am 18.03.2009 durch die Leibniz-Gemeinschaft evaluiert, wie dies für alle ihre Mitgliedsinstitute in 7-jährigem Rhythmus vorgesehen ist. Die Begehung durch die fast 30-köpfige Gutachtergruppe verlief sehr erfolgreich. Der Bericht der Evaluierungsgruppe ist außerordentlich positiv. Es scheint, dass nur wenige Leibniz Institute solch eine positive Bewertung erhalten. Ich zitiere aus der Zusammenfassung:

1. Special contributions

1.1. Evaluation

The evaluation of the MFO by the Leibniz Gemeinschaft took place on March 18, 2009, a procedure all member institutes have to surpass every 7th year. The inspection on-site by a group of about 30 evaluators was very successfull and the evaluation report has been a very positive one. It seems that only very few Leibniz Institutes receive such a positive evaluation. In the following I quote from the summary:

> "The Mathematisches Forschungsinstitut Oberwolfach (MFO) is extremely successful in its role of creating an extraordinary scientific infrastructure in the field of international mathematics.
> ...
> In close cooperation with the institute's management, the MFO's Scientific Committee ensures the coherence and originality of the institute's convincing overall scientific programme, the results of which are presented in the MFO's own publication series. The management and Committee function excellently and are supported very well by the MFO's administration. The Scientific Advisory Board supervises this work exceptionally well.
> ...
> The MFO provides an excellent infrastructure with conference rooms, guest- house and bungalows, and a mathematical library with a worldwide reputation. The IT-service is on a high level. The MFO places high value on the promotion of junior scientists through measures ranging from project orientated research visits to active integration into the Workshop Research Programme. In recent years, the institute has been remarkably successful at utilising opportunities to obtain competitive third-party funding, in particular for programmes promoting junior researchers.
> ...
> Already in its last evaluation report on the institute in 1999/2000, the Wissenschaftsrat attested the MFO an extraordinarily high quality. The MFO has maintained and built on this level of quality impressively. The few recommendations the Wissenschaftsrat did make were implemented wisely. "

Es gab einige Empfehlungen, deren Umsetzung entweder bereits geschehen ist oder mit dem Wissenschaftlichen Beirat diskutiert wird. Wichtig aus der Sicht des MFO sind insbesondere 3 Empfehlungen:

- Die dauerhafte Verankerung des OWLF Programm im Budget des MFO.
- Die Schaffung je einer zusätzlichen Stelle für einen wissenschaftlichen Mitarbeiter und in der Hauswirtschaft.
- Die Schaffung einer neuen Struktur für die Position des Direktors und des Vizedirektors, entsprechend dem Vorschlag des Wissenschaftlichen Beirats.

There have been some recommendations, which either have been realized already or which are currently under discussion by the Scientific Advisory Board. From the MFO's point of view three recommendations are of special importance:

- the OWLF-Programme should be permanently rooted in the Institute's budget.
- a further scientific assistant as well as a further member of staff in the domestic service area should be employed.
- a new structure for the position of Director and Vice Director should be created, according to suggestion of the Scientific Advisory Board

Der Bericht der Evaluierungsgruppe ist die Grundlage für die Stellungnahme des Senats der Leibniz-Gemeinschaft, die am 26.11.2009 veröffentlicht wurde. In seiner Stellungnahme schließt sich der Senat den Beurteilungen und den Empfehlungen der Bewertungsgruppe an. Insbesondere werden die Zusammenarbeit des Instituts mit der Wissenschaftlichen Kommission und dem Wissenschaftlichen Beirat sowie die Weiterentwicklung des Programm-Portfolios und die Öffentlichkeitsarbeit des MFO besonders gelobt. Es wird angeregt, die verschiedenen Programme des MFO noch weiter bekannt zu machen und bei der Ergänzung der Wissenschaftlichen Kommission auch Vorschläge aus dem Ausland zu erbitten. Bund und Ländern wird empfohlen, die Mittel für die neue Leitungsstruktur sowie für einen weiteren wissenschaftlichen Assistenten und eine zusätzliche Kraft in der Hauswirtschaft bereitzustellen. Die Stellungnahme schließt mit einer uneingeschränkten Förderempfehlung.

The statement of the Senate of the Leibniz Gemeinschaft, published on November 26, 2009, is founded on the evaluators' report. In its statement the Senate follows the judgement and recommendations of the evaluators' group. Special praise receives the cooperation between the Institute and the Scientific Committee as well as the Scientific Advisory Board and also the further development of the programme-portfolio and the public relations of the MFO. It is also recommended that the MFO should publicise its portfolio of scientific programmes to a greater extent and to request proposals for membership of the Scientific Committee whenever possible also from abroad. The German Federal Government (Bund) and the Federal States (Länder) are advised to provide the financial funds for the employment of a scientific assistant and a further member of the housekeeping staff. The report closes with a definite evaluation recommendation.

1.2. IMAGINARY 2009

1.2.1. Die IMAGINARY-Ausstellung

IMAGINARY ist eine interaktive Wanderausstellung, die auf attraktive und verständliche Weise Visualisierungen, interaktive Installationen, virtuelle Welten, 3D-Objekte und ihre theoretischen Hintergründe aus der algebraischen Geometrie und Singularitätentheorie präsentiert. Die Ausstellung wurde vom Mathematischen Forschungsinstitut Oberwolfach für das Jahr der Mathematik in Deutschland entwickelt und 2008 durch das Bundesministerium für Bildung und Forschung gefördert.

Die Ausstellung wurde im Jahr der Mathematik 2008 in über 13 deutschen Städten gezeigt. Mehr als 120 000 Personen besuchten IMAGINARY, darunter über 340 Schulen mit Schulklassen, die eine eigene Führung bekommen haben. Zusätzlich besuchten ca. 100 000 Personen Sonderausstellungen und spezielle IMAGINARY-Veranstaltungen.

Schon im Jahr 2008 zeigten andere Städte in Deutschland und im Ausland Interesse an einer Weiterführung der Ausstellung. Zahlreiche Schulen und auch Museen haben sich bereit erklärt, Inhalte der Ausstellung (interaktive Installationen, die Programme) für eigene Veranstaltungen oder eine permanente Ausstellung zu übernehmen.

Um eine nachhaltige Fortsetzung der Wanderausstellung auch nach 2008 zu garantieren, wurde das Projekt IMAGINARY 2009 entworfen, das wichtige Maßnahmen zur Verbesserung der Logistik, zur Einschulung von Koordinationspersonal und zur Aufbereitung von didaktischem und technischem Begleitmaterial vorsieht. Dadurch soll eine längerfristige und unabhängige Fortführung der Ausstellung durch Drittmittel bzw. Förderbeiträge der einzelnen Ausstellungspartner ermöglicht werden.

Zusätzlich war eine Internationalisierung der Ausstellungsinhalte (Übersetzung in andere Sprachen, Erweiterung der Webseite mit mehr Programmen und Dokumenten zum Download) notwendig, damit die Inhalte der Ausstellung und des Wissenschaftsjahres nicht nur zeitlich, sondern auch geographisch über das Jahr der Mathematik 2008 in Deutschland hinaus weitervermittelt werden können.

Das Projekt IMAGINARY 2009 wurde vom Bundesministerium für Bildung und Forschung (BMBF) mit 30 000 Euro gefördert.

1.2. IMAGINARY 2009

1.2.1. The IMAGINARY exhibition

IMAGINARY is an interactive, travelling exhibition. It contains mathematical visualizations, interactive installations, virtual realities, 3D objects, and their theoretical background in algebraic geometry and singularity theory, in an attractive and understandable manner.
The exhibition was developed by the Mathematisches Forschungsinstitut Oberwolfach for the German Year of Mathematics and funded by the German Federal Ministry of Education and Science in 2008.

The exhibition has visited more than 13 German cities during the year of mathematics 2008. More than 120 000 people visited the exhibition, among them over 340 school classes with guided tours. Additionally about 100 000 people visited the special exhibitions and IMAGINARY events.

Already during 2008 other cities in Germany and abroad showed interest in staging the exhibition. Several schools and museums agreed to use contents of the exhibition (interactive installations, software programmes) for own events or a permanent exhibition.

To guarantee a sustainable continuation of the travelling exhibition after the year 2008 the project IMAGINARY 2009 was devised. Its aim is to carry out necessary tasks to improve the logistics, to facilitate training of coordinators and to prepare didactical and technical documentation. The main goal is to enable a sustainable and independent continuation of the exhibition through third party funds and through of exhibition partners.

Furthermore, it was necessary to internationalize the exhibition contents (translation to other languages, extension of the web site by offering more programmes and documents to download). The aim is to successfully communicate the contents of the exhibition and the science year over a longer time period and also outside Germany.

The project IMAGINARY 2009 was funded with 30 000 Euro by the Federal Ministry of Education and Research in Germany.

1.2.2. Maßnahmen für eine nachhaltige Weiterführung von IMAGINARY

Im Jahr 2009 wurden Verbesserungen im Logistikbereich der Ausstellungen durchgeführt. Sie umfassten die Neuanschaffung einfach zu transportierender Aluminiumkisten und die Erneuerung gewisser Ausstellungsgegenstände, wie z.B. die Erstellung von Roll-Up Bannern statt Pinnwänden. Zu Beginn wurde eine ausführliche Inventarliste erstellt, die alle Einzelteile und den Zustand aller technischen Geräte, Werkzeuge und Bilder der Ausstellung beschreibt. Daraufhin wurde ein Lager- und Transportplan für einfache An- und Ablieferung bzw. sicheres und schnelles Ein- und Auspacken der Objekte erstellt.

Die persönliche und fachkundige Betreuung gilt als Besonderheit der Ausstellung. Um die Einschulung der BetreuerInnen zu erleichtern, wurde Begleitmaterial und eine didaktische Mappe erstellt.

Die Koordination der Ausstellung beinhaltet die Kontaktaufnahme mit den Partnern vor Ort, die Klärung aller Details und Aufgabenverteilung im Vorfeld, das Organisieren der Printmaterialien für Werbung (Flyer, Poster), das Bereitstellen von Pressetexten und Pressematerial, die Organisation der Logistik und des Aufbaus bzw. der Details vor Ort (Technik, Feuerpolizei, Versicherung). Diese Tätigkeiten wurden in mehreren Dokumenten mit den jeweiligen Aufgabenbereichen beschrieben und in einem Seminar im September 2009 mit zwei Ausstellungskoordinatoren besprochen. Die Einschulung wurde ergänzt durch Dokumente wie Email-Vorlagen, Design-Vorlagen und Checklisten für die Ausstellungskoordination und -Betreuung.

Die Inhalte der Ausstellung (Bilddaten, Erklärungstexte, Software) sind kostenlos über das Internet erhältlich. Schulen haben großes Interesse gezeigt, diese Inhalte für den Unterricht und Veranstaltungen (Tag der offenen Tür, Wissenschaftstage, etc.) zu nutzen. Zusätzlich ist eine Übernahme in Form von Duplikaten gewisser Exponate in andere Ausstellungen bzw. permanente Einrichtungen wie Museen geplant. Im neuen MiMa, Mathematik- und Mineralien Erlebniswelt Oberwolfach sollen die Stationen SURFER, Morenaments und jReality zusammen mit einer IMAGINARY-Bildgalerie permanent installiert werden (Eröffnung 30.1.2010).

Nach Vorort-Besuchen im Deutschen Museum in München im Frühjahr und Herbst 2009 konnte ein Konzept für eine Erweiterung des Mathematischen Kabinetts des Museums entworfen werden. Die Stationen SURFER, jReality und Cinderella sollen ab Herbst 2010 permanent

1.2.2. Actions for a sustainable continuation of IMAGINARY

In the year 2009 the logistics of the exhibition was improved. This included the purchase of lightweight aluminium boxes and the renewal of certain exhibits, i.e. the use of roll-up banners instead of pin boards. At the beginning of this task a detailed inventory list was made. It specifies all individual parts and describes the state of the technical equipment, tools and images of the exhibition. Then, a storage and transport plan was devised for easy transport and mounting as well as safe and fast packing and unpacking of all objects of the exhibition.

Individual and competent tutoring is one of the special features of the exhibition. To facilitate the training of the demonstrators complementary and didactical material was prepared.

To coordinate the exhibition partner organisations have to be contacted, technical details have to be clarified and tasks distributed. Additionally, print material for advertisement (flyer, poster) and a press release have to be prepared and the logistics and mounting/dismantling as well as local details (technology on site, fire police, insurance) have to be coordinated. All these tasks have been documented together with its respective tasks and communicated in a seminary to two future coordinators of the exhibition in September 2009. In this training course additional documents as e-mail and design templates and check lists for coordination and tutoring of the exhibition were used.

All contents of the exhibition (picture data, explanation texts, software) are freely available on the Internet. Schools have shown interest to use these contents in class and for events (open school days, science days, etc.). Additionally, it is planned to offer free duplication of certain exhibits for other exhibitions or a permanent installation in museums. The new MiMa, museum for minerals and mathematics in Oberwolfach, shall host the exhibits SURFER, Morenaments and jReality as well as an IMAGINARY picture gallery (opening of the museum on January 30, 2010).

After on site visits in the Deutsche Museum in Munich in spring and fall 2009 a concept was devised to extend the Mathematical Cabinet of the museum. The programmes SURFER, jReality and Cinderella are planned to be presented on a permanent basis as of fall 2010. For these

gezeigt werden. Für diese interaktiven Stationen wurden Touch-Screens erworben und die Programme aktualisiert und erweitert.

Die Nachfrage nach der Ausstellung IMAGINARY und ihren Inhalten, speziell aus dem Ausland, erforderte eine Internationalisierung der Inhalte. Die Webseite steht seit Herbst 2009 nun auch in englischer Sprache zur Verfügung. Durch eine bessere Strukturierung der Inhalte der Programme und Ausstellungsteile (Erklärungstafeln, diverse Roll-Up-Texte) ist eine Übersetzung in andere Sprachen nun einfach möglich. So wurden z.B. im Zuge der Ausstellung in Kiew große Teile der Ausstellung bereits ins Ukrainische übersetzt. Die erweiterte Medienarbeit sieht auch längerfristige Kooperationen mit deutschen und internationalen Medien vor.

Im Januar 2009 erschien der Katalog zur Wanderausstellung IMAGINARY in englischer und deutscher Sprache (ISBN: 9-783000-269394). Er wird für einen Unkostenbeitrag von 15 Euro bei den Ausstellungen und über die Webseite www.imaginary-exhibition.com/katalog.php verkauft.

1.2.3. Ausstellungsorte 2009

Im Jahr 2009 wurde IMAGINARY erstmals auch außerhalb Deutschlands gezeigt. Die Ausstellung in Wien wurde vom österreichischen Bundesminister für Wissenschaft und Forschung, Dr. Johannes Hahn, eröffnet. Mit über 80 Schulklassenführungen in drei Wochen war die Ausstellung schon vor der Eröffnung ausgebucht.

Erstmals wurde ein Teil von IMAGINARY auch im englischsprachigen Ausland gezeigt. Das MSRI in Berkeley und die Stanford University zeigten eine Auswahl der algebraischen Flächen der IMAGINARY-Ausstellung.

Im Jahr 2009 besuchten ca. 18 000 Menschen die IMAGINARY-Ausstellungen, darunter 130 Schulklassen, die eine Führung erhalten haben.

Liste der Ausstellungen und Veranstaltungen 2009

Second Live, Internet
06.01.2009 - 31.12.2009

Wien, Universität, Österreich
03.02.2009 - 20.03.2009

Dresden-Rossendorf, Deutschland
24.03.2009 - 11.05.2009

Berkeley, MSRI, USA
23.03.2009 - 19.04.2009

installations touch screens were purchased and the programmes updated and extended.

To meet the demand for the IMAGINARY exhibition, especially from abroad, the contents had to be internationalized. Since Fall 2009 the web site has been made available in English. The texts of the software programmes and the exhibits (explanation boards, roll up texts) have been structured to facilitate translations into other languages. For the Kiev exhibition, big parts of the exhibition have already been translated into Ukrainian. Extended media work also foresees a long term cooperation with German and international media.

In January 2009 the catalogue of the travelling exhibition IMAGINARY was published in English and German language (ISBN: 9-783000-269394). It is sold at a prize of 15 Euro at the exhibitions and on the web site www.imaginary-exhibition.com/katalog.php.

1.2.3. Exhibition venues 2009

In 2009, IMAGINARY was shown for the first time outside Germany. The exhibition in Vienna was opened by the Austrian Minister of Science and Research Dr. Johannes Hahn. The exhibition was booked out with more than 80 guided school tours before the inauguration.

IMAGINARY was also shown for the first time in the English speaking world. The MSRI in Berkeley and the Stanford University presented a selection of algebraic surfaces of the IMAGINARY exhibition.

In 2009, approx. 18 000 people visited the IMAGINARY exhibitions, among them 130 school classes through guided tours.

List of exhibitions and events 2009

Second Live, Internet
06.01.2009 - 31.12.2009

Vienna, University, Austria
03.02.2009 - 20.03.2009

Dresden-Rossendorf, Germany
24.03.2009 - 11.05.2009

Berkeley, MSRI, USA
23.03.2009 - 19.04.2009

IMAGINARY Lehrerfortbildung und Vorträge
April 2009, Lahore, Pakistan

Stanford, Universität, USA
27.04.2009 - 01.05.2009

Bonn, Universität, Deutschland
26.09.2009

Münster, Universität, Deutschland
29.9.2009 - 20.10.2009

Wien, Museum, Österreich
09.10.2009

Kiew, Museum für russische Kunst, Ukraine
05.11.2009 - 15.11.2009

IMAGINARY Teachers Training and Lectures
April 2009, Lahore, Pakistan

Stanford, University, USA
27.04.2009 - 01.05.2009

Bonn, University, Germany
26.09.2009

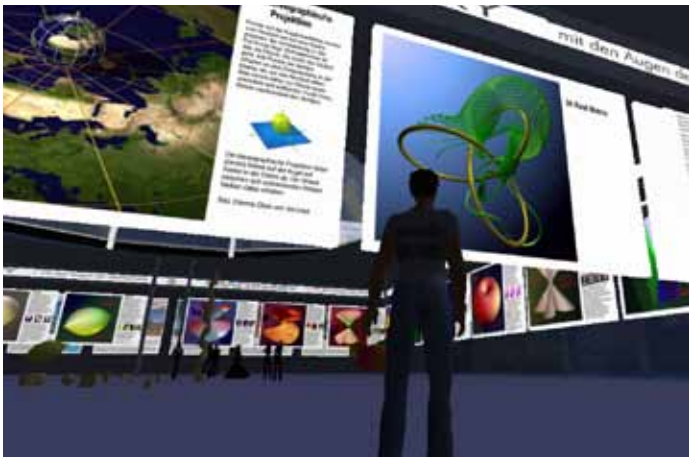
Münster, University, Germany
29.9.2009 - 20.10.2009

Vienna, Museums quarter, Austria
09.10.2009

Kiew, Museum of Russian Art, Ukraine
05.11.2009 - 15.11.2009

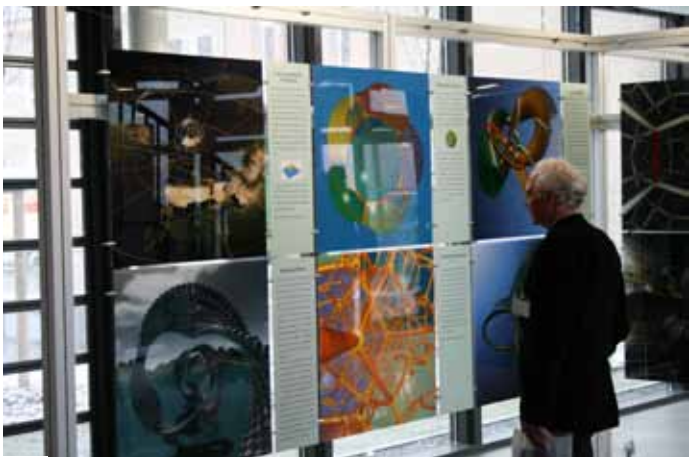
Katalog zur Ausstellung IMAGINARY
Catalogue of the IMAGINARY exhibition

http://www.imaginary-exhibition.com/katalog.php



Virtuelle IMAGINARY-Ausstellung in Second Life, Internet
Virtual IMAGINARY exhibition in Second Life, Internet

Ausstellung in der Universität Wien
Exhibition at the University of Vienna



Ausstellung im Forschungszentrum Dresden-Rossendorf
Exhibition in the research center Dresden-Rossendorf

LehrerInnenfortbildung in Lahore, Pakistan
Teachers Training in Lahore, Pakistan

Sonderausstellung im Hausdorff Center in Bonn
Special exhibition in the Hausdorff Center in Bonn

Ausstellung im Stadthaus III in Münster
Exhibition in the City Hall III in Münster

Sonderausstellung im Museumsquartier in Wien
Exhibition in the museums quarter in Vienna

Ausstellung im Museum für russische Kunst, Kiew
Exhibition in the Museum of Russian Art, Kiev

1.3. Preis: Land der Ideen

Das Mathematische Forschungsinstitut Oberwolfach wurde mit dem Preis "Ausgewählter Ort im Land der Ideen 2009" ausgezeichnet. Die Idee der interaktiven Wanderausstellung IMAGINARY für das Jahr der Mathematik 2008 wurde zusammen mit 364 anderen Orten aus 2071 Bewerbungen prämiert.

Seit 2006 wird der Preis „365 Orte im Land der Ideen" von der Initiative „Deutschland - Land der Ideen" in Zusammenarbeit mit der Deutschen Bank organisiert. Der Bundespräsident Horst Köhler, der für den Begriff „Land der Ideen" bei seiner Antrittsrede anerkannt wird, hält die Schirmherrschaft dieser Initiative inne.

Am 23. September 2009 wurde der Preis offiziell angekündigt und eine Veranstaltung vor Ort in Oberwolfach organisiert.

1.3. Award: Land of Ideas

The Mathematisches Forschungsinstitut Oberwolfach (MFO) was awarded "Selected Landmark 2009 in the Land of Ideas". With the idea of the interactive travelling exhibition IMAGINARY for the year of Mathematics 2008, the MFO won this award together with 364 other locations out of 2071 applications.

Since 2006 the competition "365 Landmarks in the Land of Ideas" has been organized by the Initiative "Deutschland - Land der Ideen" in cooperation with Deutsche Bank. German President Horst Köhler, who was widely acknowledged for first using the term "Land of Ideas" in his inaugural speech, is the patron of the initiative.

On the 23 of September 2009 the prize was officially announced and an event on site in Oberwolfach was organized.

Programm der Veranstaltung/Programme of the event

11:00 Begrüßung/Adress of Welcome, Prof. Gert-Martin Greuel (MFO)
11:10 Grußwort/Greeting, Dr.-Ing. Heike Prasse (Bundesministerium für Bildung und Forschung/ Federal Ministry of Education and Research)
11:20 Grußwort/Greeting, Tania Bolius (Ministerium für Wissenschaft, Forschung und Kunst des Landes Baden-Württemberg/Ministry of Science, Research and Art of Baden Württemberg)
11:30 Grußwort/Greeting, Dr. Klaus Tschira (Klaus Tschira Stiftung)
11:40 Grußwort/Greeting, Jürgen Nowak (Bürgermeister Oberwolfach/Mayor Oberwolfach)
11:50 Grußwort/Greeting, Manfred Hammes (Wirtschaftsregion Ortenau)
12:00 Grußwort/Greeting, Prof. Friedrich Götze (Gesellschaft für Mathematische Forschung)
12:10 Laudatio und Preisverleihung/Laudatio and award ceremony, Horst Glaser (Deutsche Bank)
12:30 Buffet-Empfang/Reception

Grußwort von Dr. Klaus Tschira
Greeting by Dr. Klaus Tschira

Preisverleihung (Prof. Gert-Martin Greuel, Horst Glaser)
Award ceremony (Prof. Gert-Martin Greuel, Horst Glaser)

1.4. Oberwolfach Vorlesung 2009

CHERN CHARACTERISTIC CLASSES IN TOPOLOGY AND ALGEBRAIC GEOMETRY

F. HIRZEBRUCH

These are notes of my Oberwolfach lecture on October 10, 2009 (§9 was not treated in the lecture). It was a great pleasure and honor for me to give this talk. I thank the director, Professor Gert-Martin Greuel, very much for the invitation. I wish the MFO, its committees, the director and all the staff continued great success in future years.

§1. Introduction

I learnt about characteristic classes for the first time when I visited Heinz Hopf in Zurich in 1948 for one week after three weeks of work on a Swiss farm [1]. Heinz Hopf visited Oberwolfach already in 1946. At the meeting of the German Mathematical Society in Danzig in 1925 [2] he had reported about his work including what is now called Poincaré-Hopf theorem:

Let X be a compact differentiable manifold of dimension $n \geq 1$ and v a continuous vector field which is different from zero in all but finitely many points, also called singularities. Then the number of singularities each counted with its proper multiplicity is independent of the vector field. It is always equal to the Euler number $e(X)$.

The multiplicity of a singularity x is equal to the degree of a map of the $(n-1)$-dimensional sphere (boundary of a small neighborhood of x) to itself. This is well defined also for non-orientable manifolds. For n odd the Euler number $e(X)$ vanishes. There exist vector fields without singularities.

I learnt from Heinz Hopf the theory of Stiefel-Whitney classes for compact differentiable manifolds. E. Stiefel was a student of Hopf, who proposed to Stiefel the problem:

Which manifolds of dimension n admit an m-field, i. e. m vector fields $v_1, \ldots, v_m$ which are linearly independent everywhere? (Compare [3], §1.5 and §2.9).

But for me the Chern classes, first introduced by S. S. Chern in 1946 [4] became more important. The book by N. Steenrod [5] of 1951 was revealing.

Consider a compact complex manifold X of complex dimension n, for example a projective algebraic manifold embedded in some complex projective space $\mathbb{P}_N(\mathbb{C})$.

An r-field is an r-tuple of vector fields on X which are complex linearly independent outside a cycle of dimension $2r-2$ which determines an element in the homology group $H_{2r-2}(X,\mathbb{Z})$. A basic fact is that such r-fields always exist and the homology class of the "cycle of singularities" does not depend on the r-field. This is intuitive and not precise. The cohomology class corresponding to the "cycle of singularities" by the Poincaré isomorphism is the Chern class

$$c_{n-r+1} \in H^{2(n-r+1)}(X,\mathbb{Z})$$

which can be defined directly and precisely by obstruction theory [5]. For $r = 1$ we have the Poincaré-Hopf theorem applied to complex manifolds. It follows

$$c_n[X] = e(X)$$

§2. Chern numbers

We denote the Chern classes of a compact complex manifold X of complex dimension n simply by

$$c_i = c_i(X) \in H^{2i}(X,\mathbb{Z})$$

The index i runs from 0 to n, where c_0 denotes the unit element of the commutative graded cohomology ring

$$H^{ev}(X,\mathbb{Z}) = \bigoplus_{i=0}^{n} H^{2i}(X,\mathbb{Z})$$

The notation ev indicates even dimensional cohomology. We have the total Chern class

$$c = 1 + c_1 + \cdots + c_n \in H^{ev}(X,\mathbb{Z})$$

For any partition $(\lambda_1, \lambda_2, \ldots, \lambda_k)$ of n we consider the number

$$c_{\lambda_1} c_{\lambda_2} \ldots c_{\lambda_k}[X], \qquad \lambda_1 + \lambda_2 + \ldots \lambda_k = n \tag{1}$$

(evaluation of a $2n$-dimensional cohomology class on the fundamental cycle of X).

The cup product of cohomology classes is used. For the corresponding homology classes intersection theory comes in. Any linear combination of numbers like (1) with rational coefficients depending only on the partition is also called Chern number.

As mentioned before, the Chern number $c_n[X]$ equals the Euler number, thus is a topological invariant. In the problem collection [6] I formulate the question:

Which Chern numbers are topological invariants of projective algebraic manifolds? (Problem 31).

Very recently D. Kotschick [7] proved:

A Chern number is a topological invariant of projective algebraic manifolds if and only if it is a multiple of the Euler number.

For Kotschick's proof the following is basic: There exist pairs of algebraic surfaces X, Y which are homeomorphic with reversal of orientation and have non-vanishing signatures. The signature is a topological invariant of *oriented* 4-dimensional manifolds. For an algebraic surface X it is a Chern number:

$$\text{signature} = \frac{c_1^2[X] - 2c_2[X]}{3}$$

The signature changes sign under reversal of orientation. This proves Kotschick's theorem for $n = 2$. The existence of pairs of surfaces (X, Y) uses deep results of Friedman ([8], [9]). In fact, X and Y are not diffeomorphic. Kotschick has also results concerning invariance of Chern numbers under diffeomorphisms and under orientation preserving diffeomorphisms.

Kotschick's work was motivated in part by an old result of Borel-Hirzebruch [10], II. §24(11), in a modified formulation by E. Calabi. Consider the projective tangent bundle of $\mathbb{P}_3(\mathbb{C})$ and the projective covariant tangent bundle of $\mathbb{P}_3(\mathbb{C})$. These two five-dimensional projective algebraic manifolds are diffeomorphic. They have as Chern numbers c_1^5 the integers 4500 and 4860 respectively.

§3. Chern classes of complex vector bundles

We study complex vector bundles (C^∞-differentiable) with fibre $\mathbb{C}^n$ and basis a compact oriented differentiable manifold X of even dimension $2m$ (for reasons of exposition). For such a vector bundle E Chern classes $c_i \in H^{2i}(X, \mathbb{Z})$ can be defined. In §1 and §2 the bundle E was always the tangent bundle of a compact complex manifold of complex

dimension n. In our more general case the Chern class c_i can be intuitively characterized by a cycle of dimension $2m-2i$ given by the singularities of an $(n-i+1)$-tuple of sections of E. For us the case $m=n$ and $i=n$ will be very important. This case is close to the Poincaré-Hopf theorem:

Take a section of E with isolated singularities. Then its number is finite and equal to $c_n[X]$ if each singularity is counted with its proper multiplicity, the degree of a map between two $(2n-1)$-dimensional spheres: $S_1^{2n-1} \to S_2^{2n-1}$.

The first sphere is the boundary of a small neighborhood of x in X, the second sphere is the boundary of a small neighborhood of the origin in the fibre of E over x.

For the Poincaré-Hopf theorem the two spheres were identical and hence orientation not needed to define a mapping degree.

The number $c_n[X]$ is independent of the section.

The total Chern class of E can be formally written as

$$(2)\quad c(E) = 1 + c_1 + \cdots + c_n = (1+x_1)(1+x_2)\ldots(1+x_n) \in H^{ev}(X,\mathbb{Z})$$

where the x_i are two-dimensional integral cohomology classes in some extension of $H^{ev}(X,\mathbb{Z})$. For this we can take H^{ev} of the flag manifold bundle $\mathfrak{F}$ associated to E. If we lift E to $\mathfrak{F}$, then E becomes a direct sum of line bundles L_i, and x_i is the first Chern class of L_i. This can also be taken as definition of the Chern classes.

Every symmetric polynomial with integral coefficients of degree k in the x_i is a polynomial with integral coefficients in the elementary symmetric functions and hence a polynomial in the Chern classes c_i defining a cohomology class of dimension $2k$.

Formula (2) and these applications represent the splitting principle in [11].

Let E and F be vector bundles of dimensions r and s over the same base manifold X. Then we have for the total Chern classes

$$c(E \oplus F) = c(E)c(F),$$

in particular for the highest Chern class

$$c_{r+s}(E \oplus F = c_r(E)c_s(F).$$

This follows easily from the splitting principle. In the sequel we shall use freely the formula for $c(E \oplus F)$. We shall make a few intuitive remarks for the highest Chern class.

§4. The highest Chern class

The operations of multilinear algebra like direct sum, tensor product, symmetric powers can be applied to complex vector bundles over X. The resulting new vector bundles have Chern classes which can be calculated as polynomials in the Chern classes of the given bundles. Some of this was developed and used in [11]. Here we are interested in the highest Chern class, because it describes the locus of zeros of a section. Let E and F be complex vector bundles of dimension r and s over X. For the direct sum we have

$$c_{r+s}(E \oplus F) = c_r(E)c_r(F) \tag{3}$$

Intuitively this is clear: Suppose we have sections in E and F, then their sum vanishes in $E \oplus F$ if and only if both sections vanish. this is the intersection of loci of zeros, corresponding to the cup product in cohomology.

Let E and F be line bundles over X. (The fibre dimension of E and F is one.) Then the tensor product is again a line bundle. We have

$$c_1(E \otimes F) = c_1(E) + c_1(F) \tag{4}$$

Intuitively: Suppose we have sections in E and F. In local coordinates the tensor product of sections is multiplication of complex numbers and vanishes if and only if one of the sections vanish: Union of the loci of zeros of E and F corresponding to addition in cohomology.

§5. The highest Chern class of the r-th symmetric power of a two-dimensional complex vector bundle

Consider a two-dimensional complex vector bundle V and suppose it is a direct sum of line bundles L_1 and L_2. With respect to a local trivialisation we can introduce coordinates ξ, η, such that L_1 is given by $\eta = 0$ and L_2 by $\xi = 0$. Then ξ and η define a local basis for the dual bundle V^* and locally the elements of the r-th symmetric power S^rV^* are the polynomials

$$\sum_{k=0}^{n} a_k \, \xi^k \, \eta^{r-k}$$

From this we conclude that

$$S^rV^* \;=\; \bigoplus_{k=0}^{r} L_1^{*k}L_2^{*(r-k)}$$

where L_1^*, L_2^* are the dual line bundles of L_1, L_2. Let x, y be the first Chern class of L_1^*, L_2^*, then the highest Chern class of S^rV^* is given by

$$c_{r+1}(S^rV^*) = \prod_{k=0}^{r}(kx + (r-k)y). \tag{5}$$

This is a polynomial in $c_1 = x + y$ and $c_2 = xy$, the Chern classes of V^*. By the splitting principle (5) holds for an arbitrary 2-dimensional vector bundle V with c_1, c_2 being the Chern classes of V^*. We give some examples of (5).

$$\begin{aligned} c_4(S^3V^*) &= 9c_2(2c_1^2 + c_2) \\ c_6(S^5V^*) &= 5^2c_2(24c_1^4 + 58c_1^2c_2 + 9c_2^2) \\ c_8(S^7V^*) &= 7^2c_2(720c_1^6 + 3708c_1^4c_2 + 3004c_1^2c_2^2 + 225c_2^3) \end{aligned} \tag{6}$$

To indicate a fast way of calculation, we observe that

$$(ax + by)(bx + ay) = abc_1^2 + (a-b)^2c_2$$

and hence

$$c_6(S^5V^*) = 5^2c_2(4c_1^2 + 9c_2)(6c_1^2 + c_2)$$

§6. The space of lines in a projective space

We consider the space X_n of projective lines in the complex projective space $\mathbb{P}_{n+1}(\mathbb{C})$. This is also the space of 2-dimensional complex linear subspaces of $\mathbb{C}^{n+2}$. Thus it is the Grassmannian $G(2, n+2)$ which is a projective algebraic manifold of dimension $2n$. We can celebrate the 125th anniversary of Schubert calculus by remembering the paper by Hermann Caesar Hannibal Schubert published in 1885 [12]. There he considers the Schubert cycle consisting of all lines in $\mathbb{P}_{n+1}$ intersecting a given $\mathbb{P}_{n-1}$-subspace of $\mathbb{P}_{n+1}$. This is a very ample divisor D in X_n corresponding to the positive generator $f_1 \in H^2(X_n, \mathbb{Z}) \simeq \mathbb{Z}$. Schubert proved [12], §5(6):

$$(7) \qquad f_1^{2n}[X_n] = \frac{(2n)!}{n!(n+1)!} = C_n = \text{the } n^{th} \text{ Catalan number.}$$

The Catalan numbers were introduced by Euler in a letter to Goldbach in 1751. Formula (7) is a special case of [10](formula (9) in 24.10 Theorem).

Let us recall the proof for our case: The holomorphic Euler number $\chi(X_n, rD)$ where the divisor D corresponds to f_1 is a polynomial in r of degree $2n$. The first Chern class of X_n equals $(n+2)f_1$. By the Kodaira vanishing theorem the holomorphic Euler number $\chi(X_n, rD)$ equals for $r > -(n+2)$ the dimension of $H^0(X_n, rD)$, the vector space of meromorphic functions f on X_n whose divisor (f) satisfies

$$(f) + rD \geq 0,$$

i. e. the divisor $(f) + rD$ does not have poles. In particular, the polynomial $\chi(X, rD)$ vanishes for $-(n+2) < r < 0$ and has the value 1 for $r = 0$. In fact,

$$(8) \qquad \chi(X_n, rD) = \frac{(r+n)(r+2)^2 \dots (r+n)^2(r+n+1)}{1 \cdot 2^2 \cdot n^2 \dots (n+1)}$$

This follows from the Riemann-Roch-Hirzebruch formula [11] and the theory of roots as explained in [10]. The RRH-formula implies that the highest coefficient of our polynomial equals

$$\frac{f_1^{2n}[X_n]}{(2n)!}$$

Formula (7) follows.

The Catalan numbers C_n are for $n \geq 0$:

$$C_n \ : \ 1, 1, 2, 5, 14, 42, 132, 429 \dots$$

In Schubert's language using intersection theory formula (7) means the following:

Take $2n$ projective subspaces in $\mathbb{P}_{n+1}$ of dimension $n-1$ in general position, then the number of lines in $\mathbb{P}_{n+1}$ intersecting each of theses subspaces equals C_n.

The manifold X_n can also be written as

(9) $$X_n = \frac{U(n+2)}{U(2) \times U(n)}$$

Over X_n we have the tautological complex vector bundles E and F of dimensions 2 and n. For the point x of X_n the fibre E_x over x is the 2-dimensional subspace of $\mathbb{C}^{n+2}$ defining x and F_x is the quotient of $\mathbb{C}^{n+2}$ by E_x. By (9) there is an isomorphism

$$E_x \oplus F_x \simeq \mathbb{C}^{n+2}$$

Therefore $E \oplus F$ is the trivial bundle. We denote the Chern classes of E by e_1, e_2, those of F by $f_1, f_2, \ldots$. Then

$$(1 + e_1 + e_2)(1 + f_1 + f_2 + \ldots) = 1$$

.

Consider the dual bundle E^* and its Chern classes c_1, c_2, formally written as

$$(1 + x)(1 + y) = 1 + c_1 + c_2 = 1 - e_1 + e_2$$

Then

$$(1 - x)(1 - y)(1 + f_2 + f_3 + \ldots) = 1$$

and

$$\begin{aligned} f_1 &= c_1 = x + y \\ f_r &= x^r + x^{r-1}y + \cdots + y^r \end{aligned}$$

In Schubert's language f_r corresponds by the Poincaré isomorphism to the cycle of all lines intersecting a given $\mathbb{P}_{n-r}$. For $r = n$ this is a projective space $\mathbb{P}_n$ which indeed has codimension n in X_n. The cohomology classes f_r vanish for $r > n$, clear by Schubert, for us because the Chern classes of F vanish for $r > n$.

§7. The lines on a smooth projective hypersurface in $\mathbb{P}_{n+1}$

A smooth hypersurface of degree d in $\mathbb{P}_{n+1}$ is given by a homogeneous polynomial of degree d in $(n+2)$-variables, the coordinates of $\mathbb{C}^{n+2}$. Hence it is an element of $S^d((\mathbb{C}^{n+2})^*)$. It defines a section in the vector bundle $S^d(E^*)$ over X_n, because a fibre of E^* is the dual vector space of a 2-dimensional linear subspace of $\mathbb{C}^{n+2}$. The lines on the hypersurface correspond to the zeros of this section, their locus is given by the highest Chern class $c_{d+1}(S^dE^*)$, hence has complex dimension $2n-d-1$. This will be a subvariety of X_n. But we do not try to make this more precise. If $d+1=2n$, the number of lines is finite. Assuming that every line has multiplicity 1, we have:

The number of lines on a hypersurface of degree $2n-1$ *in* $\mathbb{P}_{n+1}$ *is finite and equals* $c_{2n}(S^{2n-1}E^*)[X_n]$.

We have to use the Chern classes c_1, c_2 of E^* where $c_1 = f_1 = x+y$ and $c_2 = xy$. The class c_2 is represented by the subvariety X_{n-1} of X_n of complex codimension 2, and c_1 restricted to X_{n-a} is the positive generator of $H^2(X_{n-a}, \mathbb{Z})$. Therefore by (7) for $a+b=n$

$$c_2^a\, c_1^{2b}[X_n] = C_b, \tag{10}$$

the b^{th} Catalan number.

Any homogeneous symmetric polynomial of degree $2n$ in x and y is a polynomial in c_1, c_2 of complex dimension $2n$ and can be evaluated on the fundamental cycle of X_n. The vector space of these polynomials has a basis consisting of the elements $c_2^a\, c_1^{2b}$ with $a+b=n$. Using (10) we can carry out this evaluation for any such polynomial. For the number of lines on smooth hypersurfaces we use (5) and express these numbers by Catalan numbers. The first example results from (6).

The number of lines on a hypersurface of degree 3 in $\mathbb{P}_3$ equals

$$9(2C_1 + C_0) = 27.$$

The number of lines on a hypersurface of degree 5 in $\mathbb{P}_4$ equals

$$5^2(24C_2 + 58C_1 + 9C_0) = 2875 = 5^3 \cdot 23.$$

The number of lines on a hypersurface of degree 7 in $\mathbb{P}_5$ equals

$$7^2(720C_3 + 3708C_2 + 3004C_1 + 225C_0) = 698005 = 7^3 \cdot 2035.$$

Remark: The number of lines on a hypersurface occurred as a Chern number. We had to neglect, for example, the long history of the discovery and study of the 27 lines on a cubic surface. On my desk there is the classical model of a cubic surface of Clebsch and Klein defined over the reals. Here also the 27 lines are defined over the reals. Thus I can see them any time I wish. In this special case the lines have 10 triple points.

§8. A different way to determine the number of lines on a hypersurface

In the preceding section we loved to work with Catalan numbers using the basis $c_2^a\, c_1^{2b}$ with $a+b=n$ for the homogeneous symmetric polynomials in x, y of degree $2n$. The basis

$$c_2^a\, f_{2b} \qquad \text{with} \qquad a+b=n$$

may be more convenient. The evaluation of $c_2^a\, f_{2b}$ on X_n equals the evaluation of the Chern class f_{2b} on X_{n-a} where f_{2b} is now the Chern class of the complementary tautological vector bundle over X_{n-a} with fibre $\mathbb{C}^{n-a}$. But $2b = n-a+b$. Hence $c_2^a\, f_{2b}[X_n] = 0$ except for $b=0$. Then $f_0 = 1$ and c_2^n is the generator of $H^{2n}(X_n, \mathbb{Z})$: For $b=0$, we have $c_2^a\, f_{2b}[X_n] = 1$. Now we have the following result:

Let $P(x,y)$ be a symmetric polynomial in x, y of degree $2n$, then $P(x,y)[X_n]$ = coefficient of $x^{n+1}\, y^n$ in $(x-y)P(x,y)$.

This is clear because

$$(x-y)c_2^a\, f_{2b} = x^{2b+a+1}\, y^a - x^a\, y^{2b+a+1}$$

It follows:

The number of lines on a surface of degree $2n-1$ in $\mathbb{P}_{n+1}$ equals the coefficient of $x^{n+1}\, y^n$ in $(x-y)\prod_{k=0}^{2n-1}(kx+(2n-1-k)y)$

This is van der Waerden's original theorem [13]. This paper has results about the configuration of lines which we cannot mention here.

The calculation with Catalan numbers is equivalent to van der Waerden's method, because the coefficient of $x^{n+1}y^n$ in $(x-y)(x+y)^{2n}$ equals $\binom{2n}{n} - \binom{2n}{n-1} = C_n$.

For the preparation of my Oberwolfach lecture I had discussions with Pieter Moree, who gave me the paper [14]. There I found the following asymptotic formula by Don Zagier:

Let v_n be the number of lines on a hypersurface of degree $2n-3$ in $\mathbb{P}_n$, then

$$v_n \sim \sqrt{\frac{27}{\pi}}(2n-3)^{2n-\frac{7}{2}}(1-\frac{9}{8n}-\frac{111}{640n^2}-\frac{9999}{25600n^3}+\dots)$$

Don, the Oberwolfach lecturer of the preceding year, was present. I joked that he is unable to see a sequence of numbers without studying its asymptotic behavior.

§9. Higher dimensions

Consider the Grassmannian

$$X_{m,n} = \frac{U(m+n)}{U(m)\times U(n)} = G(m, m+n)$$

In the preceding sections we had $m=2$ and wrote $X_{2,n} = X_n$. Over $X_{m,n}$ we have the dual tautological vector bundle E^* with fibre $\mathbb{C}^m$ whose Chern classes generate the integral cohomology ring of $X_{m,n}$. We write the Chern classes of E^* as elementary symmetric functions in $x_1, x_2, \dots, x_m$. The Grassmannian $X_{m,n}$ has complex dimension mn. A generator of $H^{2mn}(X_m, \mathbb{Z}) \cong \mathbb{Z}$ with value 1 on the fundamental cycle is $(x_1 x_2 \dots x_m)^n$. In generalization of §8 we can prove:

Let $\mathbb{P}(x_1, \dots, x_m)$ be a symmetric polynomial in $x_1, \dots, x_m$ of degree mn, then

$$\begin{aligned}(11)\qquad \mathbb{P}(x_1,\dots,x_m)\,[X_{m,n}] = {} & \text{coefficient of} \\ & x_1^{n+m-1}x_2^{n+m-2}\dots x_m^n \text{ in} \\ & \prod_{1\le i<j\le m}(x_i-x_j)\,\mathbb{P}(x_1,\dots,x_m)\end{aligned}$$

In principle, we can use the preceding result to determine the number of $(m-1)$-dimensional projective subspaces on a hypersurface of degree d in $\mathbb{P}_{m+n-1}$. The number is finite if the fibre dimension of S^dE^* (which is also the dimension of the highest Chern class of this vector bundle) equals the dimension of $X_{m,n}$. The condition is

$$\binom{m-1+d}{m-1} = mn. \tag{12}$$

This is true for $m = 3, d = 4, n = 5$. A generic quartic in $\mathbb{P}_7$ contains $3297280 = 2^{12} \cdot 805$ projective planes. To get this number one has to evaluate

$64x_1x_2x_2(3x_1 + x_2)(3x_2 + x_3)(3x_1 + x_3)(x_1 + 3x_2)(x_2 + 3x_3)$
$(x_1 + 3x_3)(2x_1 + 2x_2)(2x_2 + 2x_3)(2x_1 + 2x_3)(x_1 + x_2 + 2x_3)$
$(x_1 + 2x_2 + x_3)(x_1 + x_2 + 2x_3)$

on $X_{3,5}$ using (11).

Another case which satisfies (12) is $m = 4$, $d = 3$, $n = 5$. A general cubic in $\mathbb{P}_8$ contains $1812768336 = 3^5 \cdot 7459952$ projective subspaces of dimension 3. The discussion in §9 up to this point I have from the book [15], in particular p. 132. A computer check-up for the case $m = 3$, $d = 4$, $n = 5$ was done for me by Chen Heng Huat (National University of Singapore, visitor of the MPI).

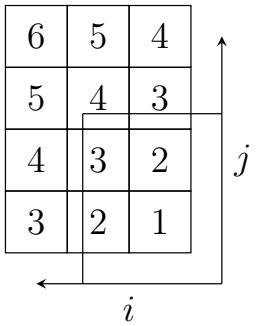
We would like to generalize the Catalan numbers, namely study the degree of the Grassmannian $X_{m,n}$. It is the number

$$deg X_{m,n} = (x_1 + \cdots + x_m)^{mn}[X_{m,n}].$$

Schubert [16] determined this number as a special case of the degrees of Schubert varieties [16](26), using an inductive method. Van der Waerden [17]((6) and (7)) reproved Schubert's results, in particular the formula

$$deg X_{m,n} = \frac{(mn)!1!2!\ldots(m-1)!}{n!(n+1)!\ldots(n+m-1)!} \tag{13}$$

A Grassmannian has a Young diagram, for example if $m = 3$, $n = 4$



Each of the mn square boxes has coordinates i, j (with $1 \leq i \leq m$ and $1 \leq j \leq n$) and a hook of length $i + j - 1$.

Formula (13) can be rewritten

$$deg X_{m,n} = \frac{(mn)!}{\text{product of all hook lengths}}$$

In our example which is also an example calculated by Schubert [16]

$$deg X_{3,4} = \frac{12!}{6!5!12} = \binom{11}{5} = 462$$

Schubert's general formula for the degree of a Schubert variety can also be written in terms of hooks of the Young diagram. Van der Waerden notes ([17] p. 204) that these degrees coincide with the degrees (dimensions) of irreducible representations of the symmetric group S_N where N is the dimension of the Schubert variety, equal to the number of boxes in the Young diagram. My information on hooks and on representations of the symmetric group comes from the book by Sagan [18]. In this book also the story about the hooks is told (Frame, Robinson, Thrall [19]).

As a final remark I mention formula (9) in my paper [20] (compare §6 above and see [10] Part II §24.10). For the case $\frac{U(m+n)}{U(m)\times U(n)}$ this formula says

$$deg \frac{U(m+n)}{U(m) \times U(n)} = \frac{(mn)!}{\prod \mu(b_k)}$$

where the complementary roots b_k are the positive roots of $U(m+n)$ which do not belong to $U(m) \times U(n)$. The b_k correspond to the mn boxes in the diagram in a natural way such that $\mu(b_k)$ becomes the hook length of the box.

The first Chern class of $X_{m,n}$ is $(m+n)(x_1 + x_2 + \cdots + x_m)$. If we substract from $m+n$ a hook length, we get again a hook length. This corresponds to a symmetry of the diagram which one can associate to Serre duality, for the following reason: Let D be a divisor on $X_{m,n}$ with characteristic class $x_1 + x_2 + \cdots + x_m$. Then the hook lengths are the negative roots of the RR-polynomial $\chi(X_{m,n}, rD)$, just as in formula (8) in the case $m = 2$. By the Plücker embedding, the Grassmannian $X_{3,4}$ becomes a smooth 12-dimensional submanifold of degree 462 in $\mathbb{P}_{34}$. We have

$$\chi(X_{3,4}, D) = \prod_{\text{hooks}} \frac{\text{hook length} + 1}{\text{hook length}} = 35 = \binom{7}{3}.$$

References

[1] F. Hirzebruch. *Bericht über meine Zeit in der Schweiz in den Jahren 1948-1950*. To appear in a volume dedicated to the 100th anniversary of the Swiss Mathematical Society in 2010

[2] H. Hopf. *Abbildung geschlossener Mannigfaltigkeiten auf Kugeln in n Dimensionen*. Jahresbericht der DMV 34 (1926), 130-133

[3] F. Hirzebruch. *Divisionsalgebren und Topologie*. In: Zahlen, 3. Aufl., Ebbinghaus et al., Springer 1992

[4] S. S. Chern. *Characteristic classes of Hermitian manifolds*. Ann. Math. 47 (1946), 85-121

[5] N. Steenrod. *The topology of fibre bundles*. Princeton Univ. Press 1951

[6] F. Hirzebruch. *Some problems on differentiable and complex manifolds*. Ann. Math. 60 (1954), 213-236

[7] D. Kotschick. *Characteristic numbers of algebraic varieties*. PNAS 106 (2009), 10114-10115

[8] M. H. Freedman. *The topology of four-manifolds*. J. Diff. Geometry 17 (1982), 357-454

[9] D. Kotschick. *Orientation-reversing homeomorphisms in surface geography*. Math. Ann. 292 (1992), 375-381

[10] A. Borel and F. Hirzebruch. *Characteristic classes and homogeneous spaces I, II*. Am. J. Math. 80 (1958), 458-538 and 81 (1959), 315-382

[11] F. Hirzebruch. *Topological methods in algebraic geometry*. Third Edition. Translation and Appendix One by R. L. E. Schwarzenberger, Appendix Two by A. Borel. Springer 1966

[12] H. Schubert. *Die n-dimensionalen Verallgemeinerungen der fundamentalen Anzahlen unseres Raumes*. Math. Ann. 26 (1885), 26-51

[13] B. L. van der Waerden. *Zur algebraischen Geometrie. II. Die geraden Linien auf den Hyperflächen des P_n*. Math. Ann. 108 (1933), 253-259

[14] D. B. Grünberg, P. Moree, Appendix by D. Zagier. *Sequences of enumerative geometry: congruences and asymptotics*. Experiment. Math. 17 (2008),409-426

[15] L. Manivel, Translated by J. R. Swallow. *Symmetric Functions, Schubert Polynomials and Degeneracy Loci*. AMS and SMF 1998

[16] H. Schubert. *Anzahl-Bestimmungen für lineare Räume beliebiger Dimension*. Acta Mathematica 8 (1886), 97-118

[17] B. L. van der Waerden. *Zur algebraischen Geometrie. VIII. Der Grad der Graßmannschen Mannigfaltigkeiten der linearen Räume S_m in S_n*. Math. Ann. 113 (1936), 199-205

[18] B. E. Sagan. *The symmetric group. Representations, combinatorial algorithms, and symmetric functions*. Second Edition. Springer 2001

[19] J. S. Frame, G. de B. Robinson, R. M. Thrall. *The hook graphs of the symmetric group*. Canad. J. Math. 6 (1954), 316-325

[20] F. Hirzebruch. *Characteristic numbers of homogeneous domains*. In: Seminars on analytic functions, Vol. II, 92-104. IAS, Princeton, 1957

2. Wissenschaftliches Programm

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

2.1. Übersicht der Programme

Das Mathematische Forschungsinstitut Oberwolfach (MFO) hat sechs große zentrale Aufgaben: Das Workshop-Programm, das Miniworkshop-Programm, die Arbeitsgemeinschaften, die Oberwolfach Seminare, das Research in Pairs Programm, sowie die Oberwolfach Leibniz Fellows. Daneben gibt es zusätzliche Serviceleistungen des MFO.

Das Workshop-Programm
Das wissenschaftliche Hauptprogramm besteht in der jährlichen Durchführung von etwa 40 einwöchigen Workshops mit je etwa 50 Teilnehmern. Alternativ können auch parallel zwei Workshops halber Größe (ca. 25 Teilnehmer) stattfinden. Die Workshops werden von international führenden Experten der jeweiligen Fachgebiete organisiert und die Teilnehmer werden nach Empfehlung durch die Organisatoren vom Direktor persönlich eingeladen. Ein besonderes Charakteristikum der Oberwolfacher Workshops ist die Forschungsorientierung. Immer wieder wird von den Gastforschern darauf hingewiesen, wie stimulierend die Atmosphäre ist. Viele bedeutende Forschungsprojekte haben ihre Entstehung der Durchführung eines Workshops in Oberwolfach zu verdanken.

Das Miniworkshop Programm
Im Rahmen dieses Programms können jährlich 12 einwöchige Miniworkshops mit je etwa 15 Teilnehmern veranstaltet werden. Diese Miniworkshops wenden sich besonders an junge Forscher und ermöglichen es, auf aktuelle Entwicklungen schnell zu reagieren, da über die Themen der Miniworkshops erst ein halbes Jahr vor der Veranstaltung entschieden wird.

2. Scientific programme

The director of the institute decides on the scientific programme in cooperation with the scientific board of the Gesellschaft für Mathematische Forschung e.V. For the scientific programme, this is the most important panel of the institute. It is based on the honorary work of about 20 to 25 top-class mathematicians, covering all areas of mathematics. The scientific board examines all scientific events at the institute prior to their approval. The programme 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 programme

The Mathematisches Forschungsinstitut Oberwolfach (MFO) focuses its main scientific activities on six central programmes: The Workshop Programme, the Mini-Workshop Programme, the Oberwolfach Arbeitsgemeinschaft, the Oberwolfach Seminars, the Research in Pairs Programme, and the Oberwolfach Leibniz Fellows. In addition there are some further services provided by the MFO.

The Workshop Programme
The main scientific programme 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 organised by internationally leading experts in the relevant fields. The participants are personally invited by the Director after recommendation by the organisers. A special characteristic feature of the Oberwolfach Workshops is the research orientation. Very often the guest researchers appreciate the stimulating atmosphere. Many significant research projects owe their origin to the realisation of a workshop in Oberwolfach.

The Mini-Workshop Programme
This programme offers 12 week-long mini-workshops per year, each with about 15 participants. These mini-workshops are aimed especially at junior researchers, and allow proposals to react to recent developments, since the subjects are fixed only half a year before the mini-workshops take place.

Die Oberwolfach Arbeitsgemeinschaft
Die Idee der Arbeitsgemeinschaft für junge, aber auch für bereits etablierte Forscher ist, 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. Christopher Deninger und Prof. Gerd Faltings organisiert.

The Oberwolfach Arbeitsgemeinschaft
The idea of the Arbeitsgemeinschaft ('Research Group') for young as well as for senior researchers 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 organised by Prof. Christopher Deninger and Prof. Gerd Faltings.

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 Doktoranden und Postdoktoranden aus aller Welt. Das Ziel ist, 25 Teilnehmer mit einem besonders aktuellen Arbeitsgebiet bekannt zu machen.

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

Wir freuen uns, dass die Carl Friedrich von Siemens Stiftung bereit ist, die Oberwolfach Seminare von Sommer 2008 bis Sommer 2013 substanziell zu unterstützen.

We are pleased that the Carl Friedrich von Siemens Foundation has decided to support the Oberwolfach Seminars from summer 2008 to summer 2013 substantially.

Das Research in Pairs Programm
Ein weiterer Forschungsschwerpunkt ist das Programm „Research in Pairs" (RiP). Dieses Programm ermöglicht es jeweils 2 bis 4 Forschern, die von verschiedenen Institutionen kommen, 2 Wochen bis 3 Monate am Mathematischen Forschungsinstitut Oberwolfach für die Arbeit an einem vorher festzulegenden Projekt zu verbringen.

The Research in Pairs Programme
A further main activity of the Institute is the Research in Pairs (RiP) Programme. This programme 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
In diesem Postdoktoranden-Programm werden seit Januar 2007 besonders qualifizierte Nachwuchswissenschaftler in einer entscheidenden Phase ihrer wissenschaftlichen Laufbahn durch Bereitstellung idealer Arbeitsbedingungen in einem internationalen Umfeld gefördert. Exzellente junge Forscher und Forscherinnen können sich allein oder in Kleingruppen zur Durchführung eines Forschungsprojekts in Oberwolfach von zwei bis zu sechs Monaten bewerben. Wichtig ist die Einbindung der Oberwolfach Leibniz Fellows in eine aktive Arbeitsgruppe mit einem etablierten Wissenschaftler einer Universität oder einer Forschungseinrichtung. 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 Fellows
The focus of this postdoctoral programme which has started in January 2007, is to support excellent young researchers in an important period of their scientific career by providing ideal working conditions in an international atmosphere. Outstanding young 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 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
Seit Beginn des Jahres 2009 unterstützt das MFO die Teilnahme von im Durchschnitt fünf Doktoranden an den Oberwolfach Workshops. Dies neue

Oberwolfach Leibniz Graduate Students
Since the beginning of 2009, the MFO has been supporting the participation of an average of 5 young doctoral students per Oberwolfach Workshop. This

Programm wurde von der Leibniz-Gemeinschaft innerhalb des „Pakt für Forschung und Innovation" für eine erste Periode von 2009 bis 2011 gewährt. Gefördert werden exzellente Doktoranden oder frisch Promovierte bis zu zwei Jahren nach der Promotion, insbesondere durch Reisekostenunterstützung. Es handelt sich um fünf zusätzliche Plätze pro Workshop, die nicht durch etablierte Forscher besetzt werden dürfen.

new programme has been approved by the Leibniz-Gemeinschaft within the "Pakt für Forschung und Innovation" for a first period from 2009 to 2011. It addresses to excellent graduate students and recent post docs (the Ph.D./Dr. degree must be received not more than 2 years ago, counted from the date of the workshop), and gives suport by the reimbursement of travel costs. For this programme, each Oberwolfach Workshop is given an extra capacity of 5 workshop places which is reserved for these young candidates and may not be taken by senior researchers.

Die Oberwolfach Reports

Um die Ergebnisse der Workshops auch einem international weiten Kreis zugänglich zu machen, wurde 2004 als neue regelmäßige Publikation 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 3000 Seiten in einer Auflage von 300 Stück. Die OWR beinhalten erweiterte Kurzfassungen aller Vorträge im Umfang von jeweils ein bis drei Seiten, einschließlich Literaturhinweisen, und belegen das ausgezeichnete Niveau der Veranstaltungen. Viele neue Entdeckungen und Entwicklungen wurden im Institut zum ersten Mal einem ausgesuchten Kreis von Forschern vorgestellt und sind in den Oberwolfach Reports dokumentiert. Die OWR sind international auf großes Interesse gestoßen, was sich in der grossen Zahl von Abonnenten und Tauschpartnern zeigt.

The Oberwolfach Reports

The 'Oberwolfach Reports' (OWR) were initiated in 2004 as a new series of publications of the institute 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, of one up to three pages per talk, including references. The aim is to report periodically upon the state of mathematical research, and to make these reports available to the mathematical community. The OWR provide proof of the excellent level of the events at the MFO. Many new discoveries and developments have been introduced at the institute to a selected group of researchers and are documented in the Oberwolfach Reports. The OWR have been warmly welcomed worldwide, with numerous subscribers and partners participating in exchange arrangements.

Oberwolfach Preis und John Todd Award

Der Oberwolfach Preis wird etwa alle drei Jahre von der Gesellschaft für mathematische Forschung e.V. und der Oberwolfach Stiftung an junge europäische Forscher 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 junge Forscher auf dem Gebiet der numerischen Analysis. Der Oberwolfach Preis ist mit 5000 Euro und der John Todd Award mit 1000 Euro dotiert.

Oberwolfach Prize and John Todd Award

The Oberwolfach Prize is awarded by the Gesellschaft für mathematische Forschung e.V. and by the Oberwolfach Stiftung to young European mathematicians. 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 young scientists in numerical analysis. The Oberwolfach Prize amounts to 5000 Euro and the John Todd Award to 1000 Euro.

Weitere Aktivitäten

In zweijährlichem Wechsel finden Fortbildungsveranstaltungen für Lehrer bzw. Bibliothekare des Landes Baden-Württemberg statt. Im Jahr 2009 fand eine Fortbildung für Bibliothekare statt. Das Institut beherbergt auch die abschliessende Trainingswoche für besonders begabte Schüler zur Vorbereitung auf die Internationale Mathematik-Olympiade. Als Dienst für die Öffentlichkeit sind besonders die Oberwolfach Foto-Datenbank, die Oberwolfach References for Mathematical Software (ORMS) und die Wanderausstellung IMAGINARY zu nennen.

Further activities

On a two-year rotation, a training week for school teachers (respectively librarians) of the State of Baden-Württemberg takes place. In 2008, a training week for school teachers was held. The Institute also hosts 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) and the travelling exhibition IMAGINARY are to be mentioned.

2.2. Jahresprogramm 2009

Im Jahr 2009 wurden während 42 Wochen Workshops durchgeführt, sowie 12 Miniworkshops während vier Wochen, 6 Oberwolfach Seminare während drei Wochen und zwei Arbeitsgemeinschaften während zwei Wochen. Insgesamt nahmen mehr als 2500 Forscher aus aller Welt an allen Programmen teil, davon ca. 30% aus Deutschland, 40% aus Resteuropa und 30% 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 2009

In the year 2009 workshops have taken place during 42 weeks, as well as 12 mini-workshops during four weeks, 6 Oberwolfach Seminars during three weeks and two Arbeitsgemeinschaften during two weeks. In total, more than 2,500 researchers from all over the world attended the Oberwolfach research programme, about 30% from Germany, 40% from the rest of Europe, and 30% from non-European countries. The Institute emphasizes that all fields of mathematics and related areas are represented, including applications. The following scientific programme gives proof of this policy.

Workshops:

04.01. – 10.01.2009 **Toric Geometry**
Organisers: Klaus Altmann, Berlin
Victor Batyrev, Tübingen
Yael Karshon, Toronto

11.01. – 17.01.2009 **Discrete Differential Geometry**
Organisers: Alexander I. Bobenko, Berlin
Richard Kenyon, Paris
John Sullivan, Berlin
Günter M. Ziegler, Berlin

18.01. – 24.01.2009 **Random Trees**
Organisers: Ellen Baake, Bielefeld
Donald A. Dawson, Ottawa
Andreas Greven, Erlangen
Frank den Hollander, Leiden

25.01. – 31.01.2009 **Numerical Techniques for Optimization Problems with PDE Constraints**
Organisers: Matthias Heinkenschloss, Houston
Ronald H.W. Hoppe, Augsburg
Volker Schulz, Trier

01.02. – 07.02.2009 **The Arithmetic of Fields**
Organisers: Moshe Jarden, Tel Aviv
Florian Pop, Philadelphia
Leila Schneps, Paris

08.02. – 14.02.2009 **Low Eigenvalues of Laplace and Schrödinger Operators**
Organisers: Mark Ashbaugh, Columbia
Rafael Benguria, Santiago de Chile
Richard Laugesen, Urbana
Timo Weidl, Stuttgart

08.02. – 14.02.2009 **Wave Motion**
Organisers: Adrian Constantin, Dublin
Joachim Escher, Hannover
Robin Johnson, Newcastle-upon-Tyne
Walter Strauss, Providence

22.02. – 28.02.2009 **Control Theory: On the Way to New Application Fields**
Organisers: Frank Allgöwer, Stuttgart
Uwe Helmke, Würzburg
Eduardo Sontag, New Brunswick

08.03. – 14.03.2009 **Enveloping Algebras and Geometric Representation Theory**
Organisers: Shrawan Kumar, Chapel Hill
Peter Littelmann, Köln
Wolfgang Soergel, Freiburg

15.03. – 21.03.2009 **Sparse Recovery Problems in High Dimensions: Statistical Inference and Learning Theory**
Organisers: Peter Bartlett, Berkeley
Vladimir Koltchinskii, Atlanta
Alexandre Tsybakov, Paris
Sara van der Geer, Zürich

22.03. – 28.03.2009 **Representations of Finite Groups**
Organisers: Joseph Chuang, Bristol
Markus Linckelmann, Aberdeen
Gunter Malle, Kaiserslautern
Jeremy Rickard, Bristol

05.04. – 11.04.2009 **Homotopy Theory of Function Spaces and Related Topics**
Organisers: Yves Felix, Louvain-la-Neuve
Gregory Lupton, Cleveland
Samuel Smith, Philadelphia

05.04. – 11.04.2009 **Hilbert Modules and Complex Geometry**
Organisers: Ronald G. Douglas, College Station
Jörg Eschmeier, Saarbrücken
Harald Upmeier, Marburg

12.04. – 18.04.2009 **Multiplier Ideal Sheaves in Algebraic and Complex Geometry**
Organisers: Yum-Tong Siu, Cambridge MA
Mihai Paun, Nancy
Stefan Kebekus, Köln
Georg Schumacher, Marburg

19.04. – 25.04.2009 **Kommutative Algebra**
Organisers: Winfried Bruns, Osnabrück
Hubert Flenner, Bochum
Craig Huneke, Lawrence

26.04. – 02.05.2009 **Combinatorics and Probability**
Organisers: Noga Alon, Tel Aviv
Bela Bollobas, Cambridge
Ingo Wegener, Dortmund

03.05. – 09.05.2009 **Mathematical Biology**
Organisers: Emmanuele DiBenedetto, Nashville
Benoit Perthame, Paris
Angela Stevens, Heidelberg

10.05. – 16.05.2009 **Quadratic Forms and Linear Algebraic Groups**
Organisers: Detlev Hoffmann, Nottingham
Alexander S. Merkurjev, Los Angeles
Jean-Pierre Tignol, Louvain-la-Neuve

17.05. – 23.05.2009 **Topological and Variational Methods for Partial Differential Equations**
Organisers: Thomas Bartsch, Giessen
E. Norman Dancer, Sydney

24.05. – 30.05.2009 **Manifold Perspectives**
Organisers: Ian Hambleton, Hamilton
Erik K. Pedersen, Kobenhavn
Andrew Ranicki, Edinburgh
Holger Reich, Düsseldorf

07.06. – 13.06.2009 **Strings, Fields and Topology**
Organisers: Dennis Sullivan, New York
Stephan Stolz, Notre Dame
Peter Teichner, Berkeley

14.06. – 20.06.2009 **Computational Multiscale Methods**
Organisers: Carsten Carstensen, Berlin
Björn Engquist, Austin/Princeton

21.06. – 27.06.2009 **Algebraische Zahlentheorie**
Organisers: Guido Kings, Regensburg
Mark Kisin, Chicago
Otmar Venjakob, Heidelberg

28.06. – 04.07.2009 **Algebraic K-Theory and Motovic Cohomology**
Organisers: Thomas Geisser, Los Angeles
Annette Huber-Klawitter, Leipzig
Uwe Jannsen, Regensburg
Marc Levine, Boston

05.07. – 11.07.2009 **Dynamische Systeme**
Organisers: Hakan Eliasson, Paris
Helmut W. Hofer, New York
Jean-Christophe Yoccoz, Paris

12.07. – 18.07.2009 **Explicit Methods in Number Theory**
Organisers: Karim Belabas, Talence
Hendrik W. Lenstra, Leiden
Don B. Zagier, Bonn

19.07. – 25.07.2009 **Mathematical Aspects of Hydrodynamics**
Organisers: Gregory Seregin, St. Petersburg
Vladimir Sverak, Minneapolis

26.07. – 01.08.2009 **Differentialgeometrie im Großen**
Organisers: Olivier Biquard, Paris
Bernhard Leeb, München
Gang Tian, Princeton

02.08. – 08.08.2009 **Partielle Differentialgleichungen**
Organisers: Tom Ilmanen, Zürich
Rainer Schätzle, Tübingen
Neil Trudinger, Canberra
Georg S. Weiss, Tokyo

09.08. – 15.08.2009 **Linear and Nonlinear Eigenproblems for PDEs**
Organisers: Andrew Knyazev, Denver
Volker Mehrmann, Berlin
John Osborn, College Park
Jinchao Xu, University Park

16.08. – 22.08.2009 **Scaling Limits in Models of Statistical Mechanics**
Organisers: Kenneth Alexander, Los Angeles
Marek Biskup, Los Angeles
Remco van der Hofstad, Eindhoven
Vladas Sidoravicius, Rio de Janeiro

23.08. – 29.08.2009 **Challenges in Statistical Theory: Complex Data Structures and Algorithmic Optimization**
Organisers: Rudolf J. Beran, Davis
Claudia Klüppelberg, München
Wolfgang Polonik, Davis

30.08. – 05.09.2009 **Mathematics of Complex Quantum Systems**
Organisers: Volker Bach, Mainz
Jean-Marie Barbaroux, Toulon
Lars Jonsson, Stockholm

06.09. – 12.09.2009 **Noncommutative Geometry**
Organisers: Alain Connes, Paris
Joachim Cuntz, Münster
Marc A. Rieffel, Berkeley

13.09. – 19.09.2009 **PDE and Materials**
Organisers: John Ball, Oxford
Richard D. James, Minneapolis
Stefan Müller, Leipzig

20.09. – 26.09.2009 **Singularities**
Organisers: Andras Nemethi, Budapest
Duco van Straten, Mainz
Victor A. Vassiliev, Moscow

27.09. – 03.10.2009 **Complex Algebraic Geometry**
Organisers: Fabrizio Catanese, Bayreuth
Yujiro Kawamata, Tokyo
Gang Tian, Princeton
Eckart Viehweg, Essen

11.10. – 17.10.2009 **Mathematical Aspects of General Relativity**
Organisers: Piotr Chrusciel, Tours/Oxford
James Isenberg, Eugene
Alan Rendall, Golm

25.10. – 31.10.2009 **History and Philosophy of Mathematical Notations and Symbolism**
Organisers: Karine Chemla, Paris
Eberhard Knobloch, Berlin
Antoni Malet, Barcelona

01.11. – 07.11.2009 **Design and Analysis of Infectious Disease Studies**
Organisers: Martin Eichner, Tübingen
Elizabeth Halloran, Seattle
Philip O'Neill, Nottingham

15.11. – 21.11.2009 **Complexity Theory**
Organisers: Peter Bürgisser, Paderborn
Joachim von zur Gathen, Bonn
Oded Goldreich, Rehovot
Madhu Sudan, MIT Cambridge

29.11. – 05.12.2009 **Convex Geometry and its Applications**
Organisers: Keith Ball, London
Martin Henk, Magdeburg
Monika Ludwig, New York

13.12. – 19.12.2009 **Material Theories**
Organisers: Antonio DeSimone, Trieste
Stephan Luckhaus, Leipzig
Lev Truskinovsky, Palaiseau

Miniworkshops:

15.02. – 21.02.2009 **Category Theory and Related Fields: History and Prospects**
Organisers: Ralf Krömer, Nancy
Colin McLarty, Cleveland
Michael Wright, Fougeres

15.02. – 21.02.2009 **Product Systems and Independence in Quantum Dynamics**
Organisers: B.V. Rajarama Bhat, Bangalore
Uwe Franz, Besancon/Sendai
Michael Skeide, Campobasso

15.02. – 21.02.2009 **Support Varieties**
Organisers: Karin Erdmann, Oxford
Henning Krause, Paderborn

01.03. – 07.03.2009 **Numerical Upscaling for Flow Problems: Theory and Applications**
Organisers: Achi Brandt, Rehovot
Yalchin Efendiev, College Station
Oleg Iliev, Kaiserslautern

01.03. – 07.03.2009 **The Pisot Conjecture - From Substitution Dynamical Systems to Rauzy Fractals and Meyer Sets**
Organisers: Valerie Berthe, Montpellier
David Damanik, Houston
Daniel Lenz, Chemnitz

01.03. – 07.03.2009 **Non-Negativity is a Quantum Phenomenon**
Organisers: Stephane Launois, Kent
Tom Lenagan, Edinburgh

08.11. – 14.11.2009 **Spectrum of Transfer Operators: Recent Developments and Applications**
Organisers: Viviane Baladi, Paris
Gerhard Keller, Erlangen
Carlangelo Liverani, Roma

08.11. – 14.11.2009 **Formal Methods in Commutative Algebra: A View Toward Constructive Homological Algebra**
Organisers: Thierry Coquand, Göteborg
Alban Quadrat, Sophia Antipolis
Ihsen Yengui, Sfax

08.11. – 14.11.2009 **Feinstrukturtheorie und Innere Modelle**
Organisers: Ronald Jensen, Berlin
Menachem Magidor, Jerusalem
Ralf Schindler, Münster

06.12. – 12.12.2009 **The Escaping Set in Transcendental Dynamics**
Organisers: Walter Bergweiler, Kiel
Gwyneth Stallard, Milton Keynes

06.12. – 12.12.2009 **Modeling and Understanding Random Hamiltonians: Beyond Monotonicity, Linearity and Independence**
Organisers: Günter Stolz, Birmingham
Ivan Veselic, Chemnitz

06.12. – 12.12.2009 **Geometry of Quantum Entanglement**
Organisers: Andreas Buchleitner, Freiburg
Stanislaw Szarek, Paris and Cleveland
Elisabeth Werner, Cleveland and Lille
Karol Zyczkowski, Krakow

Oberwolfach Seminare:

31.05. – 06.06.2009 **Bounded Cohomology**
Organisers: Michelle Bucher-Karlsson, Stockholm
Nicolas Monod, Lausanne
Pierre Py, Chicago

31.05. – 06.06.2009 **Equidistribution of Finite Volume Orbits on Homogeneous Spaces**
Organisers: Manfred Einsiedler, Columbus
Philippe Michel, Lausanne
Elon Lindenstrauss, Jerusalem/Princeton

18.10. – 24.10.2009 **The Erlangen Program, Myths and Realities: Geometry and Group Theory, 1870-1920**
Organisers: Igor Dolgachev, Ann Arbor
David Rowe, Mainz
Klaus Volkert, Köln
Duco van Straten, Mainz

18.10. – 24.10.2009 **Semiparametric and Nonparametric Regression**
Organisers: Raymond Carroll, College Station
Ciprian Crainiceanu, Baltimore
Matthew Wand, Wollongong

22.11. – 28.11.2009 **New Trends in Algorithms for Real Algebraic Geometry**
Organisers: Saugata Basu, Atlanta
Monique Laurent, Amsterdam
Marie-Francoise Roy, Rennes
Frank Sottile, College Station

22.11. – 28.11.2009 **Computational Fluid Dynamics**
Organisers: Michael Dumbser, Trento
Christiane Helzel, Bochum
Michael Junk, Konstanz
Claus-Dieter Munz, Stuttgart

Arbeitsgemeinschaften:

29.03. – 04.04.2009 **Optimal Transport and Geometry**
Organisers: Felix Otto, Bonn
Karl-Theodor Sturm, Bonn

04.10. – 09.10.2009 **Minimal Surfaces**
Organisers: William H. Meeks, Amherst
Matthias Weber, Bloomington

Fortbildungsveranstaltungen:

16.05.-23.05.2009 **Trainings- und Abschluß-Seminar für die Internationale Mathematik-Olympiade**
Organiser: Hans-Dietrich Gronau, Rostock

25.10. – 31.10.2009 **Fortbildungsveranstaltung für Bibliotheksleiter**
Organiser: Petra Hätscher, Konstanz

2.3. Workshops
WORKSHOP 0902

04.01. - 10.01.2009 **Toric Geometry**

Organisers: Klaus Altmann, Berlin
Victor Batyrev, Tübingen
Yael Karshon, Toronto

ABSTRACT
Toric Geometry originated from investigations of torus actions on geometric and algebraic objects. It is addressed through algebraic geometry, symplectic geometry, equivariant topology, as well as the theory of convex polyhedra within discrete mathematics. In spite of using their own language these completely different disciplines often observe similar or even identical combinatorial phenomena. Thus toric geometry leads to a fascinating and fruitful interplay between these disciplines.

PARTICIPANTS
Altmann, Klaus (Berlin), Bailey, Michael (Toronto), Baranovsky, Vladimir (Irvine), Batyrev, Victor V. (Tübingen), Birkner, Rene (Berlin), Blume, Mark (Tübingen), Braden, Thomas C. (Amherst), Brion, Michel (Saint-Martin-d'Heres), Brown, Gavin D. (Loughborough), Buchstaber, Victor M. (Moscow), Chen, Linda (Swarthmore), Craw, Alastair (Glasgow), Di Rocco, Sandra (Stockholm), Dickenstein, Alicia (Buenos Aires), Franz, Matthias (London), Haase, Christian (Berlin), Haddad, Fatima (Tübingen), Hausen, Jürgen (Tübingen), Hering, Milena (Minneapolis), Hille, Lutz (Münster), Hinsch, Laura (Berlin), Hochenegger, Andreas (Berlin), Ilten, Nathan Owen (Berlin), Karshon, Yael (Toronto), Kastner, Lars (Berlin), Kessler, Liat (Cambridge), Kiritchenko, Valentina (Moscow), Lin, Yi (Statesboro), Maclagan, Diane (Coventry), McDuff, Dusa (Stony Brook), Nill, Benjamin (Berlin), Nisse, Mounir (Paris), Panov, Taras E. (Moscow), Payne, Sam (Stanford), Perling, Markus (Bochum), Petersen, Lars (Berlin), Piene, Ragni (Oslo), Pinsonnault, Martin (London), Siebert, Bernd (Hamburg), Smith, Gregory G. (Kingston, Ontario), Stapledon, Alan (Ann Arbor), Süß, Hendrik (Cottbus), Teissier, Bernard (Paris), Tevelev, Jenia (Amherst), Timashev, Dmitri (Moscow), Treutlein, Jaron (Tübingen), Tribolet de Abreu, Miguel (Lisboa), Vergne, Michele (Paris), Vollmert, Robert (Berlin), Witt, Frederik (München)

WORKSHOP 0903

11.01. - 17.01.2009 **Discrete Differential Geometry**

Organisers: Alexander I. Bobenko, Berlin
Richard Kenyon, Providence
John Sullivan, Berlin
Günter M. Ziegler, Berlin

ABSTRACT

Discrete Differential Geometry is an active mathematical terrain where differential geometry (the theory of smooth manifolds, providing notions of curvature, flows, integrability, etc.) interacts with discrete geometry (concerned with polyhedral surfaces, frameworks and their rigidity, polytopes and their subdivisions, etc.), using tools and ideas from all parts of mathematics, including, for example, conformal geometry, integrable systems, algebraic combinatorics, mathematical physics (discrete electrodynamics, hydrodynamics and elasticity), computational geometry, and geometry processing. At the second Oberwolfach workshop on Discrete Differential Geometry, 26 lectures and an open problems session have taken place.

PARTICIPANTS

Bauer, Ulrich (Göttingen), Ben-Chen, Mirela (Haifa), Benedetti, Bruno (Berlin), Bloch, Ethan (Annandale-on-Hudson), Bobenko, Alexander I. (Berlin), Brehm, Ulrich (Dresden), Bücking, Ulrike (Berlin), Connelly, Robert (Ithaca), Edelsbrunner, Herbert (Klosterneuburg), Effenberger, Felix (Stuttgart), von Gagern, Martin (Garching), Hertrich-Jeromin, Udo (Bath), Hoffmann, Tim (Garching), Huhnen-Venedey, Emanuel (Berlin), Izmestiev, Ivan (Berlin), Joswig, Michael (Darmstadt), Kenyon, Richard (Providence), Kühnel, Wolfgang (Stuttgart), Lange, Carsten (Berlin), Lukyanenko, Inna (Berlin), Luo, Feng (Piscataway), Lutz, Frank H. (Berlin), Matschke, Benjamin (Berlin), Mercat, Christian (Montpellier), O'Rourke, Joseph (Northampton), Ollivier, Yann (Lyon), Pak, Igor (Los Angeles), Panina, Gaiane (St. Petersburg), Pinkall, Ulrich (Berlin), Polthier, Konrad (Berlin), Richter-Gebert, Jürgen (Garching), Rote, Günter (Berlin), Schief, Wolfgang K. (Berlin), Schlenker, Jean-Marc (Toulouse), Schmid, Michael (Garching bei München), Schulze, Bernd (Berlin), Sechelmann, Stefan (Berlin), Springborn, Boris (Berlin), Stephenson, Kenneth (Knoxville), Streinu, Ileana (Northampton), Sullivan, John M. (Berlin), Suris, Yuri B. (Berlin), Tabachnikov, Serge (University Park), Wallner, Johannes (Graz), Wardetzky, Max (Göttingen), Ziegler, Günter M. (Berlin)

WORKSHOP 0904

18.01. - 24.01.2009 **Random Trees**

Organisers: Ellen Baake, Bielefeld
Donald A. Dawson, Ottawa
Andreas Greven, Erlangen
Frank den Hollander, Leiden

ABSTRACT

The meeting was devoted to *random trees*, a central concept in mathematics that provides a key way of thinking about *relationships* between objects such as particles in a fluid, individuals in a population, or labels in a search algorithm. Particular emphasis was put on the role of random trees in *physics, biology*, and *computer science*.

PARTICIPANTS

Baake, Ellen (Bielefeld), Baake, Michael (Bielefeld), Berestycki, Julien (Paris), Bertoin, Jean (Paris), Birkner, Matthias (Berlin), Blath, Jochen (Berlin), Bovier, Anton (Bonn), Cerny, Jiri (Zürich), Chauvin, Brigitte (Versailles), Curien, Nicolas (Paris), Dawson, Donald A. (Ottawa), De Sanctis, Luca (Roma), Devroye, Luc (Montreal), Duquesne, Thomas (Paris), Eldon, Bjarki (Cambridge), Evans, Steven N. (Berkeley), Glöde, Patric Karl (Erlangen), Greven, Andreas (Erlangen), Grübel, Rudolf (Hannover), den Hollander, Frank (Leiden), Hutzenthaler, Martin (Frankfurt/M.), Jagers, Peter (Göteborg), Jana, Nabin Kumar (Bonn), Kersting, Götz (Frankfurt), Krug, Joachim (Köln), Külske, Christof (Groningen), Kurtz, Tom (Madison), Le Gall, Jean-Francois (Orsay), Marckert, Jean-Francois (Talence), Miermont, Gregory (Orsay), Möhle, Martin (Düsseldorf), Neininger, Ralph (Frankfurt), Pfaffelhuber, Peter (Freiburg), Piotrowiak, Sven (Erlangen), Popovic, Lea (Montreal), Sargsyan, Ori (Cambridge), Slade, Gordon (Vancouver), Spano, Dario (Coventry), Steinrücken, Matthias (Berlin), Sturm, Anja (Newark), Swart, Jan M. (Praha), Tavare, Simon (Los Angeles), Veber, Amandine (Paris), Wakeley, John (Cambridge), Wakolbinger, Anton (Frankfurt/M.), Winter, Anita (Erlangen), Zivkovic, Daniel (Köln)

WORKSHOP 0905

25.01. - 31.01.2009 **Numerical Techniques for Optimization Problems with PDE Constraints**

Organisers: Matthias Heinkenschloss, Houston
Ronald H.W. Hoppe, Augsburg
Volker Schulz, Trier

ABSTRACT

The development, analysis and implementation of efficient and robust numerical techniques for optimization problems associated with partial differential equations (PDEs) is of utmost importance for the optimal control of processes and the optimal design of structures and systems in modern technology. The successful realization of such techniques invokes a wide variety of challenging mathematical tasks and thus requires the application of adequate methodologies from various mathematical disciplines. During recent years, significant progress has been made in PDE constrained optimization both concerning optimization in function space according to the paradigm 'Optimize first, then discretize' and with regard to the fast and reliable solution of the large-scale problems that typically arise from discretizations of the optimality conditions. The contributions at this Oberwolfach workshop impressively reflected the progress made in the field.

PARTICIPANTS

Antil, Harbir (Houston), Bank, Randolph E. (La Jolla), Blank, Luise (Regensburg), Borzi, Alfio (Benevento), Braess, Dietrich (Bochum), Burns, John Allen (Blacksburg), Carlini, Elisabetta (Roma), Cristiani, Emiliano (Roma), Desideri, Jean-Antoine (Sophia Antipolis), Gaevskaya, Alexandra (Augsburg), Gauger, Nicolas R. (Braunschweig), Gerdts, Matthias (Birmingham), Ghattas, Omar (Austin), Gill, Philip E. (La Jolla), Griewank, Andreas (Berlin), Hardesty, Sean (Houston), Heinkenschloss, Matthias (Houston), Herzog, Roland (Chemnitz), Hintermüller, Michael (Berlin), Hinze, Michael (Hamburg), Hömberg, Dietmar (Berlin), Hoffmann, Karl-Heinz (Garching), Hoppe, Ronald H.W. (Augsburg), Kaltenbacher, Barbara (Graz), Kelley, C.Tim (Raleigh), Kunisch, Karl (Graz), Kunoth, Angela (Paderborn), Langer, Ulrich (Linz), Leugering, Günter (Erlangen), Linsenmann, Christopher (Augsburg), Pesch, Hans-Josef (Bayreuth), Potschka, Andreas (Heidelberg), Ridzal, Denis (Albuquerque), Sachs, Ekkehard (Trier), Schiela, Anton (Berlin), Schillings, Claudia (Trier), Schmidt, Stephan (Trier), Schulz, Volker (Trier), Sigmund, Ole (Lyngby), Sokolowski, Jan (Vandoeuvre les Nancy), Tröltzsch, Fredi (Berlin), Ulbrich, Michael (Garching), Ulbrich, Stefan (Darmstadt), Vexler, Boris (Garching), Weiser, Martin (Berlin), Wittum, Gabriel (Frankfurt), Yousept, Irwin (Augsburg)

WORKSHOP 0906

01.02. - 07.02.2009 **The Arithmetic of Fields**

Organisers: Moshe Jarden, Tel Aviv
Florian Pop, Philadelphia
Leila Schneps, Paris

ABSTRACT

The workshop "The Arithmetic of Fields" focused on a series of problems concerning the interplay between number theory, arithmetic and algebraic geometry, Galois theory, and model theory, such as: the Galois theory of function fields / covers of varieties, rational points on varieties, Galois cohomology, local-global principles, lifting/specializing covers of curves, model theory of finitely generated fields, etc.

PARTICIPANTS

Bary-Soroker, Lior (Ramat Aviv, Tel Aviv), Bassa, Alp (Lausanne), Bouw, Irene (Ulm), Chatzidakis, Zoe (Paris), Chinburg, Ted C. (Philadelphia), Ciperiani, Mirela (New York), Colliot-Thelene, Jean-Louis (Orsay), Debes, Pierre (Villeneuve d'Ascq.), Demangos, Luca (Villeneuve d'Ascq.), Dettweiler, Michael (Heidelberg), Edoukou, Frederic A.B. (Marseille), Efrat, Ido (Beer Sheva), Fehm, Arno (Tel Aviv), Frey, Gerhard (Essen), Geyer, Wulf-Dieter (Erlangen), Green, Barry William (Stellenbosch), Gruendken, Linda (Philadelphia), Haran, Dan (Tel Aviv), Harbater, David (Philadelphia), Hartmann, Julia (Aachen), Herfort, Wolfgang (Wien), Holschbach, Armin (Regensburg), Jarden, Moshe (Tel Aviv), Kani, Ernst (Kingston, Ontario), Koenigsmann, Jochen (Oxford), Matzat, B. Heinrich (Heidelberg), Moret-Bailly, Laurent (Rennes), Müller, Peter (Würzburg), Nakamura, Hiroaki (Okayama), Obus, Andrew S. (Philadelphia), Pal, Ambrus (London), Paran, Elad (Ramat Aviv, Tel Aviv), Petersen, Sebastian (Neubiberg), Ploner, Pietro (Roma), Poonen, Bjorn (Cambridge), Pop, Florian (Philadelphia), Prestel, Alexander (Konstanz), Razon, Aharon (Tel Aviv), Ribes, Luis (Ottawa), Roquette, Peter (Heidelberg), Scheiderer, Claus (Konstanz), Schlank, Tomer (Jerusalem), Schneps, Leila (Paris), Stevenson, Katherine F. (Northridge), Stix, Jakob (Heidelberg), Szamuely, Tamas (Budapest), Voloch, Jose Felipe (Austin), Wewers, Stefan (Hannover), Wickelgren, Kirsten (Stanford), Zalesski, Pavel Alexandr. (Brasilia), Zywina, David (Philadelphia)

08.02. - 14.02.2009 **Low Eigenvalues of Laplace and Schrödinger Operators**

Organisers:
Mark Ashbaugh, Columbia
Rafael Benguria, Santiago de Chile
Richard Laugesen, Urbana
Timo Weidl, Stuttgart

ABSTRACT

This workshop brought together researchers interested in eigenvalue problems for Laplace and Schrödinger operators. The main topics of discussions and investigations covered Dirichlet and Neumann eigenvalue problems, inequalities for the spectral gap, isoperimertic problems and sharp Lieb–Thirring type inequalities. The focus included not only the analytic and geometric sides of the problems, but also related probabilistic and computational aspects.

PARTICIPANTS

Ashbaugh, Mark S. (Columbia), Banuelos, Rodrigo (West Lafayette), Benguria, Rafael (Santiago), Bucur, Dorin (Le Bourget du Lac), Burchard, Almut (Toronto), Carlen, Eric (Piscataway), Chasman, L. Mercredi (Urbana), Demirel, Semra (Stuttgart), Frank, Rupert L. (Princeton), Freitas, Pedro (Lisboa), Geisinger, Leander (Stuttgart), Harrell, Evans M. (Atlanta), Helffer, Bernard (Orsay), Henrot, Antoine (Vandoeuvre les Nancy), Hermi, Lotfi (Tucson), Hundertmark, Dirk (Urbana), Kawohl, Bernd (Köln), Kovarik, Hynek (Torino), Laptev, Ari (London), Laugesen, Richard S. (Urbana), Loss, Michael (Atlanta), Nadirashvili, Nikolai (Marseille), Polterovich, Iosif (Montreal), Siudeja, Bartlomiej (Urbana), Stubbe, Joachim (Lausanne), Weidl, Timo (Stuttgart)

WORKSHOP 0907b

08.02. - 14.02.2009 **Wave Motion**

Organisers: Adrian Constantin, Dublin
Joachim Escher, Hannover
Robin Johnson, Newcastle-upon-Tyne
Walter Strauss, Providence

ABSTRACT

This workshop was devoted to recent progress in the mathematical study of water waves, with special emphasis on nonlinear phenomena. Both aspects related to the governing equations (free boundary Euler equations) as well as aspects related to various model equations were of interest. Fluids have been a rich source of deep mathematical theories for over 200 years. The conference focused on four very active areas involving fluids: Water waves with vorticity, stability theory of fluids, mathematical aspects of edge waves, and current aspects of integrable systems and solitons.

PARTICIPANTS

Constantin, Adrian (Wien), Ehrnstrom, Mats (Hannover), Escher, Joachim (Hannover), Henry, David (Dublin), Holden, Helge (Trondheim), Hur, Vera Mikyoung (Cambridge), Ivanov, Rossen (Dublin), Johnson, Robin (Newcastle upon Tyne), Kolev, Boris (Marseille), Lannes, David (Talence), Lenells, Jonatan (Cambridge), Lin, Zhiwu (Atlanta), Lippoth, Friedrich (Hannover), Matioc, Anca (Hannover), Matioc, Bogdan (Hannover), Molinet, Luc (Villetaneuse), Schneider, Guido (Stuttgart), Strauss, Walter A. (Providence), Toland, John F. (Bath), Varvaruca, Eugen (London), Villari, Gabriele (Firenze), Wahlen, Erik (Lund), Walsh, Samuel (Providence), Yin, Zhaoyang (Guangzhou)

WORKSHOP 0909

22.02. - 28.02.2009 **Control Theory: On the Way to New Application Fields**

Organisers: Frank Allgöwer, Stuttgart
Uwe Helmke, Würzburg
Eduardo Sontag, Piscataway

ABSTRACT

Control theory is an interdisciplinary field that is located at the crossroads of pure and applied mathematics with systems engineering and the sciences. Recently, deep interactions are emerging with new application areas, such as systems biology, quantum control and information technology. In order to address the new challenges posed by the new application disciplines, a special focus of this workshop has been on the interaction between control theory and mathematical systems biology. To complement these more biology oriented focus, a series of lectures in this workshop was devoted to the control of networks of systems, fundamentals of nonlinear control systems, model reduction and identification, algorithmic aspects in control, as well as open problems in control.

PARTICIPANTS

Byrnes, Christopher I. (St. Louis), Allgöwer, Frank (Stuttgart), Angeli, David (London), Antoulas, Athanasios C. (Houston), Chaves, Madalena (Sophia Antipolis), Colonius, Fritz (Augsburg), Damm, Tobias (Kaiserslautern), Dirr, Gunther (Würzburg), Ebenbauer, Christian (Cambridge), Enciso, German (Irvine), Findeisen, Rolf (Magdeburg), Fliess, Michel (Palaiseau), Flockerzi, Dietrich (Magdeburg), Fromion, Vincent (Jouy-en-Josas), Fuhrmann, Paul A. (Beer-Sheva), Grüne, Lars (Bayreuth), Helmke, Uwe (Würzburg), Hirche, Sandra (München), Ilchmann, Achim (Ilmenau), Isidori, Alberto (Roma), Jacob, Birgit (Wuppertal), Junge, Oliver (Garching bei München), Kawan, Christoph (Augsburg), Kemmetmüller, Wolfgang (Wien), Knobloch, Hans Wilhelm (Würzburg), Krener, Arthur J. (Monterey), Kugi, Andreas (Wien), Lindquist, Anders (Stockholm), Lohmann, Boris (München), Lunze, Jan (Bochum), Mathis, Wolfgang (Hannover), Nair, Girish (Melbourne), Nijmeijer, Henk (Eindhoven), Picci, Giorgio (Padova), Praly, Laurent (Fontainebleau), Radde, Nicole (Stuttgart), Rantzer, Anders (Lund), Respondek, Witold (Mont Saint Aignan), Richter, Jan (Bochum), van der Schaft, Arjan (AK Groningen), Schlacher, Kurt (Linz-Auhof), Sepulchre, Rodolphe (Liege Sart-Tilman), Sontag, Eduardo D. (Piscataway), Sussmann, Hector J. (Piscataway), Tibken, Bernd (Wuppertal), Waldherr, Steffen (Stuttgart), Wirth, Fabian (Würzburg), Zerz, Eva (Aachen)

WORKSHOP 0911

01.03. - 07.03.2009 **Enveloping Algebras and Geometric Representation Theory**

Organisers: Shrawan Kumar, Chapel Hill
Peter Littelmann, Köln
Wolfgang Soergel, Freiburg

ABSTRACT

The meeting brought together experts investigating Lie theory from the geometric, algebraic and combinatorial points of view to discuss recent progress and bring forward the research in this area by fostering scientific interaction. The meeting was attended by over 50 participants from all over the world, including quite a few younger researchers. Particularly exciting seemed to us the new results on decompositions of tensor products in the case of quantum affine algebras and its relation to cluster algebras; Bruhat graphs in representation theory and geometry; differential operators and rational Cherednik algebras; construction of semisimple tensor categories; quiver varieties and branching; GIT cones and applications; and the brand new solution of Luna's longstanding conjecture on the classification of wonderful spherical varieties.

PARTICIPANTS

Andersen, Henning Haahr (Aarhus), Baur, Karin (Zürich), Belkale, Prakash (Chapel Hill), Berenstein, Arkady (Eugene), Bliem, Thomas (Köln), Boysal, Arzu (Bebek, Istanbul), Braverman, Alexander (Providence), Brion, Michel (Saint-Martin-d'Heres), Chari, Vyjayanthi (Riverside), Cupit-Foutou, Stephanie (Köln), Ehrig, Michael (Bonn), Feigin, Evgeny (Moscow), Fiebig, Peter (Erlangen), Finkelberg, Michael (Moscow), Fourier, Ghislain (Köln), Gordon, Iain (Edinburgh), Gorelik, Maria (Rehovot), Greenstein, Jacob (Riverside), Griffeth, Stephen (Minneapolis), Heckenberger, Istvan (Köln), Hernandez, David (Palaiseau), Jantzen, Jens Carsten (Aarhus), Joseph, Anthony (Rehovot), Juteau, Daniel (Caen), Kedem, Rinat (Urbana), Klostermann, Inka (Köln), Knop, Friedrich (Erlangen), Kostant, Bertram (Cambridge), Kumar, Shrawan (Chapel Hill), Leclerc, Bernard (Caen), Levasseur, Thierry (Brest), Littelmann, Peter (Köln), Moreau, Anne (Zürich), Nakajima, Hiraku (Kyoto), Nguyen, An Hoa (Köln), Panyushev, Dmitri I. (Moscow), Papi, Paolo (Roma), Ressayre, Nicolas (Montpellier), Schiffmann, Olivier (Paris), Schilling, Anne (Davis), Schnürer, Olaf (Bonn), Serganova, Vera V. (Berkeley), Shimozono, Mark (Blacksburg), Soergel, Wolfgang (Freiburg), Stroppel, Catharina (Bonn), Tange, Rudolf H. (York), Vasserot, Eric (Paris), Williamson, Geordie (Oxford), Yakimova, Oksana (Erlangen)

WORKSHOP 0912

15.03. - 21.03.2009

Sparse Recovery Problems in High Dimensions: Statistical Inference and Learning Theory

Organisers: Peter Bartlett, Berkeley
Vladimir Koltchinskii, Atlanta
Alexandre Tsybakov, Paris
Sara van der Geer, Zuerich

ABSTRACT

The statistical analysis of high dimensional data requires new techniques, extending results from nonparametric statistics, analysis, probability, approximation theory, and theoretical computer science. The main problem is how to unveil, (or to mimic performance of) sparse models for the data. Sparsity is generally meant in terms of the number of variables included, but may also be described in terms of smoothness, entropy, or geometric structures. A key objective is to adapt to unknown sparsity, yet keeping computational feasibility.

PARTICIPANTS

Arias-Castro, Ery (La Jolla), Bartlett, Peter L. (Berkeley), Birge, Lucien (Paris), Bühlmann, Peter (Zürich), Bunea, Florentina (Tallahassee), Candes, Emmanuel (Stanford), Dahlhaus, Rainer (Heidelberg), Dalalyan, Arnak (Marne-la-Vallee), DeVore, Ronald A. (College Station), Donoho, David L. (Stanford), Dümbgen, Lutz (Bern), Gather, Ursula (Dortmund), van de Geer, Sara (Zürich), Goldenshluger, Alexander (Haifa), Golubev, Yuri (Marseille), Härdle, Wolfgang (Berlin), Horowitz, Joel L. (Evanston), Iouditski, Anatoli (Grenoble), Johnstone, Iain M. (Stanford), Kerkyacharian, Gerard (Paris), Koltchinskii, Vladimir (Atlanta), Lecue, Guillaume (Marseille), Lepski, Oleg (Marseille), Lounici, Karim (Cambridge), Lugosi, Gabor (Barcelona), Mammen, Enno (Mannheim), Meier, Lukas (Zürich), Meinshausen, Nicolai (Oxford), Mitchell, Charles (Zürich), Munk, Axel (Göttingen), Niyogi, Partha (Chicago), Nobel, Andrew B. (Chapel Hill), Picard, Dominique (Paris), Pontil, Massimiliano (London), Pouet, Christophe (Marseille), Reiß, Markus (Berlin), Rigollet, Philippe (Princeton), Ritov, Yaacov (Jerusalem), Rohde, Angelika (Hamburg), Salmon, Joseph (Paris), Schienle, Melanie (Berlin), Spokoiny, Vladimir G. (Berlin), Steinwart, Ingo (Los Alamos), Tsybakov, Alexandre B. (Malakoff), van der Vaart, Aad W. (Amsterdam), Vayatis, Nicolas (Cachan), Wainwright, Martin (Berkeley), Wegkamp, Marten (Tallahassee), Yang, Yuhong (Minneapolis), Yu, Bin (Berkeley), Zhang, Tong (Piscataway), Zhang, Cun-Hui (Piscataway)

WORKSHOP 0913

22.03. - 28.03.2009 **Representations of Finite Groups**

Organisers: Joseph Chuang, London
Markus Linckelmann, Aberdeen
Gunter Malle, Kaiserslautern
Jeremy Rickard, Bristol

ABSTRACT

The workshop *Representations of Finite Groups* was organised by Joseph Chuang (London), Markus Linckelmann (Aberdeen), Gunter Malle (Kaiserslautern) and Jeremy Rickard (Bristol). It covered a wide variety of aspects of the representation theory of finite groups and related objects like Hecke algebras. A particular focus was placed on the rapidly evolving area of fusion systems.

PARTICIPANTS

Benson, David J. (Aberdeen), Bessenrodt, Christine (Hannover), Boltje, Robert (Santa Cruz), Bonnafe, Cedric (Besancon), Bouc, Serge (Amiens), Broue, Michel (Paris), Cabanes, Marc (Paris), Carlson, Jon F. (Athens), Chlouveraki, Maria (Lausanne), Craven, David A. (Oxford), Danz, Susanne (Oxford), Eaton, Charles W. (Manchester), Erdmann, Karin (Oxford), Fong, Paul (Chicago), Geck, Meinolf (Aberdeen), Iancu, Lacri (Aberdeen), Jacon, Nicolas (Besancon), Juteau, Daniel (Caen), Kessar, Radha (Aberdeen), Koshitani, Shigeo (Chiba-Shi), Külshammer, Burkhard (Jena), Kunugi, Naoko (Tokyo), Leary, Ian J. (Columbus), Linckelmann, Markus (Aberdeen), Malle, Gunter (Kaiserslautern), Mazza, Nadia (Lancaster), Miyachi, Hyohe (Nagoya), Murray, John (Kildare), Navarro, Gabriel (Burjassot Valencia), Oliver, Robert (Villetaneuse), Olsson, Jörn Börling (Kobenhavn), Park, Sejong (Aberdeen), Puig, Lluis (Paris), Ragnarsson, Kari (Chicago), Rickard, Jeremy (Bristol), Rouquier, Raphael (Oxford), Späth, Britta (Paris), Srinivasan, Bhama (Chicago), Stancu, Radu (Amiens), Symonds, Peter (Manchester), Thevenaz, Jacques (Lausanne), Tiep, Pham Huu (Tucson), Turner, Will (Aberdeen), Turull, Alexandre (Gainesville), Webb, Peter J. (Minneapolis), Xu, Fei (Paderborn)

WORKSHOP 0915a

05.04. - 11.04.2009 **Homotopy Theory of Function Spaces and Related Topics**

Organisers: Yves Felix, Louvain-la-Neuve
Gregory Lupton, Cleveland
Samuel Smith, Philadelphia

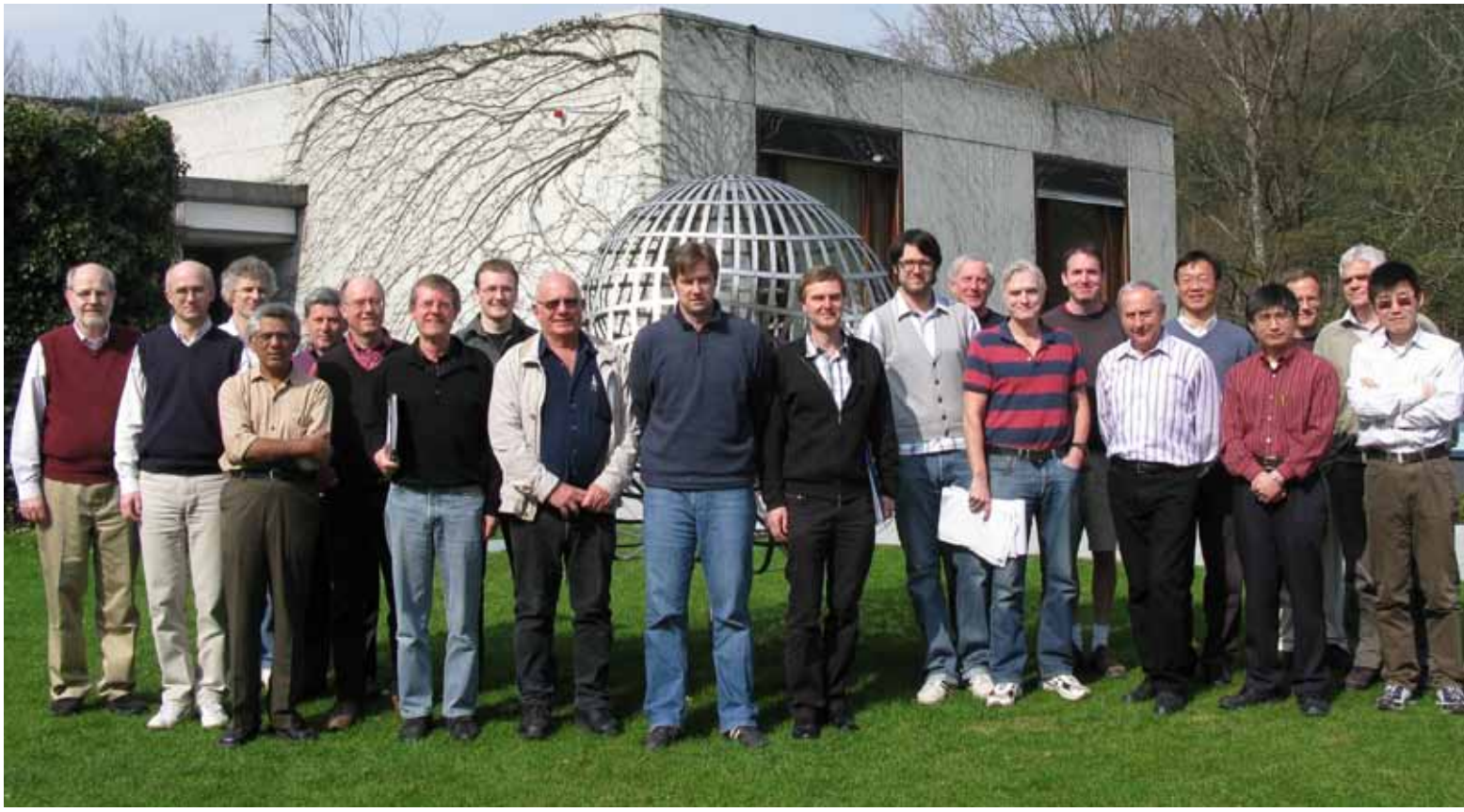
ABSTRACT

This workshop brought together researchers studying a variety of problems related to the homotopy theory of function spaces. Topics covered included: evaluation maps and Gottlieb groups, the classification of gauge groups and of other function space components, algebraic models for function spaces both in the rational and in the p-local settings, operads, configuration spaces, free and based loop spaces and infinite-dimensional Lie groups.

PARTICIPANTS

Arkowitz, Martin (Hanover), Boyle, Meadhbh (Aberdeen), Buijs, Urtzi Martin (Malaga), Chataur, David (Villeneuve d'Ascq), Felix, Yves (Louvain-la-Neuve), Fuchssteiner, Martin (Darmstadt), Gatsinzi, Jean-Baptiste (Gaborone), Golasinski, Marek (Torun), Gottlieb, Daniel Henry (Marina Del Rey), Kuribayashi, Katsuhiko (Nagano), Lazarev, Andrey (Leicester), Lupton, Gregory M. (Cleveland), Oprea, John F. (Cleveland), Parent, Paul-Eugene (Ottawa), Salvatore, Paolo (Roma), Scott, Jonathan (Cleveland), Smith, Samuel Bruce (Philadelphia), Strom, Jeff (Kalamazoo), Tanre, Daniel (Villeneuve d'Ascq.), Terzic, Svjetlana (Podgorica), Tsukuda, Shuichi (Okinawa), Viruel, Antonio (Malaga), Wockel, Christoph (Göttingen)

WORKSHOP 0915b



05.04. - 11.04.2009 **Groups and Geometries**

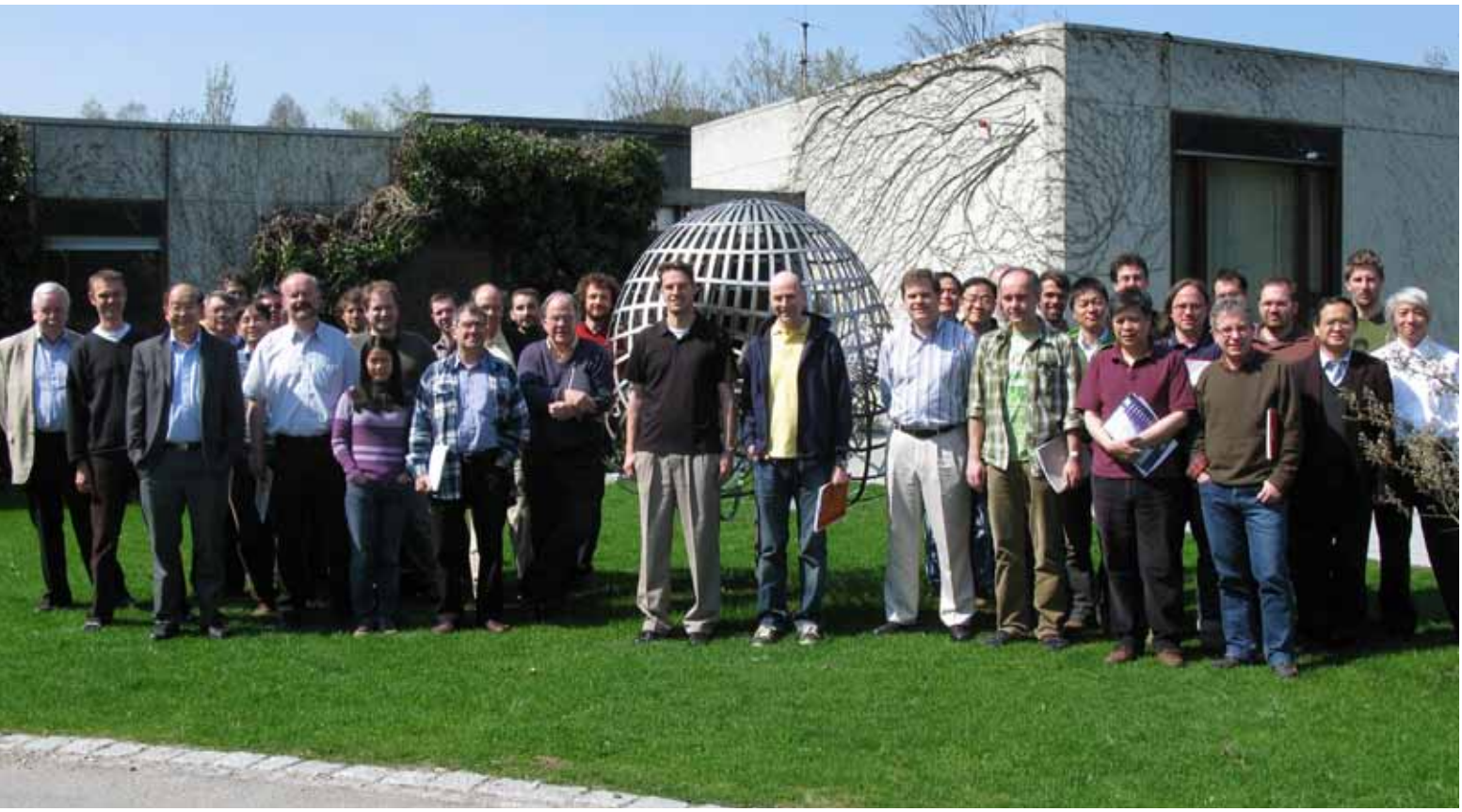
Organisers: Ronald G. Douglas, College Station
Jörg Eschmeier, Saarbrücken
Harald Upmeier, Marburg

ABSTRACT

The major topics discussed in this workshop were Hilbert modules of analytic functions on domains in C_n, Toeplitz and Hankel operators, the interplay of commutative algebra, complex analytic geometry and multivariable operator theory, coherent and quasi-coherent sheaves as localizations of Hilbert modules, Hilbert bundles and Jordan varieties on Cartan domains.

PARTICIPANTS

Andersson, Mats (Göteborg), Arazy, Jonathan (Haifa), Davidson, Kenneth R. (Waterloo), Douglas, Ronald G. (College Station), Englis, Miroslav (Praha), Eschmeier, Jörg (Saarbrücken), Everard, Kevin Claude (Saarbrücken), Fang, Xiang (Manhattan), Jury, Michael T. (Gainesville), Koranyi, Adam (Bronx), McCarthy, John E. (St. Louis), Misra, Gadadhar (Bangalore), Neeb, Karl-Hermann (Erlangen), Putinar, Mihai (Santa Barbara), Richter, Stefan (Knoxville), Rochberg, Richard (St. Louis), Schwarz, Benjamin (Marburg), Sundberg, Carl (Knoxville), Upmeier, Harald (Marburg), Vasilescu, Florian-Horia (Villeneuve d'Ascq.), Wick, Brett D. (Atlanta), Yang, Rongwei (Albany), Zhang, Genkai (Göteborg)



12.04. - 18.04.2009 **Multiplier Ideal Sheaves in Algebraic and Complex Geometry**

Organisers: Stefan Kebekus, Köln
Mihai Paun, Nancy
Georg Schumacher, Marburg
Yum-Tong Siu, Cambridge MA

ABSTRACT

The workshop *Multiplier Ideal Sheaves in Algebraic and Complex Geometry*, organised by Stefan Kebekus (Freiburg), Mihai Paun (Nancy), Georg Schumacher (Marburg) and Yum-Tong Siu (Cambridge MA) was held April 12th – April 18th, 2009. Since the previous Oberwolfach conference in 2004, there have been important new developments and results, both in the analytic and algebraic area, e.g. in the field of the extension of L^2-holomorphic functions, the solution of the ACC conjecture, log-canonical rings, the Kähler-Ricci flow, Seshadri constants and the analogues of multiplier ideals in positive characteristic.

PARTICIPANTS

An, Ta Thi Hoang (Essen), Aust, Holger (Marburg), Axelsson, Reynir (Reykjavik), Barlet, Daniel (Vandoeuvre les Nancy), Bauer, Thomas (Marburg), Berndtsson, Bo (Göteborg), Blickle, Manuel (Essen), Broustet, Amael (Villeneuve d'Ascq), Diverio, Simone (Roma), Eckl, Thomas (Liverpool), Ein, Lawrence (Chicago), Heier, Gordon (Riverside), Huckleberry, Alan T. (Bochum), Hwang, Jun-Muk (Seoul), Kebekus, Stefan (Freiburg), Kovacs, Sandor (Seattle), Küronya, Alex (Budapest), Lazic, Vladimir (St. Martin d'Heres), Marinescu, George (Köln), Neumann, Sebastian (Freiburg), Ohsawa, Takeo (Nagoya), Paun, Mihai (Vandoeuvre les Nancy), Peternell, Thomas M. (Bayreuth), Phong, Duong H. (New York), Popovici, Dan (Toulouse), Radloff, Ivo (Bayreuth), Rousseau, Erwan (Strasbourg), Schumacher, Georg (Marburg), Schwede, Karl (Ann Arbor), Siu, Yum-Tong (Cambridge), Szemberg, Tomasz (Bonn), Takagi, Shunsuke (Fukuoka), To, Wing-Keung (Singapore), Trapani, Stefano (Roma), Varolin, Dror (Stony Brook), Yeung, Sai-Kee (West Lafayette), Zhou, Xiangyu (Beijing)

WORKSHOP 0917

19.04. - 25.04.2009 **Kommutative Algebra**

Organisers: Winfried Bruns, Osnabrück
Hubert Flenner, Bochum
Craig Huneke, Lawrence

ABSTRACT

The workshop brought together researchers on various areas of Commutative Algebra. New results in combinatorial commutative algebra, homological methods and invariants, characteristic p-methods, and in general commutative algebra and algebraic geometry were presented in the lectures of the workshop.

PARTICIPANTS

Avramov, Luchezar (Lincoln), Blickle, Manuel (Essen), Brenner, Holger (Osnabrück), Bruns, Winfried (Osnabrück), Buchweitz, Ragnar-Olaf (Toronto), Caviglia, Giulio (West Lafayette), Chardin, Marc (Paris), Conca, Aldo (Genova), Cutkosky, Steven Dale (Columbia), Ein, Lawrence (Chicago), Eisenbud, David (Berkeley), Enescu, Florian (Atlanta), Fischbacher-Weitz, Helena (Osnabrück), Flenner, Hubert (Bochum), Geramita, Anthony V. (Genova), Hellus, Michael (Leipzig), Herzog, Jürgen (Essen), Hibi, Takayuki (Osaka), Hochster, Melvin (Ann Arbor), Huneke, Craig (Lawrence), Hyry, Eero (Tampereen Yliopisto), Iyengar, Srikanth B. (Lincoln), Kämpf, Gesa (Osnabrück), Katz, Daniel (Lawrence), Katzman, Mordechai (Sheffield), Kovalenko, Sergei (Bochum), Kunz, Ernst (Regensburg), Kurano, Kazuhiko (Kawasaki), Manaresi, Mirella (Bologna), Mermin, Jeffrey (Lawrence), Miller, Ezra (Durham), Monsky, Paul (Waltham), Murai, Satoshi (Kyoto), Nagel, Uwe (Lexington), Perling, Markus (Bochum), Polini, Claudia (Notre Dame), Römer, Tim (Osnabrück), Schenzel, Peter (Halle), Schreyer, Frank-Olaf (Saarbrücken), Sharp, Rodney Y. (Sheffield), Singh, Anurag (Salt Lake City), Smith, Gregory G. (Kingston, Ontario), Storch, Uwe (Bochum), Takagi, Shunsuke (Fukuoka), Trung, Ngo-Viet (Hanoi), Ulrich, Bernd (West Lafayette), Varbaro, Matteo (Genova), Verma, Jugal K. (Mumbai), Watanabe, Keiichi (Tokyo), Yoshino, Yuji (Okayama)

26.04. - 02.05.2009 **Combinatorics and Probability**

Organisers: Noga Alon, Tel Aviv
Béla Bollobás, Cambridge
Ingo Wegener, Dortmund

ABSTRACT

The effective application of probabilistic reasoning in the study of problems in diverse areas is one of the most exciting recent developments in Mathematics. Probabilistic methods turned out to be very powerful in Discrete Mathematics, Analysis, Number Theory and Theoretical Computer Science. The meeting was dedicated to recent developments in these areas, focusing on the investigation of combinatorial problems for random sets and probabilistic methods, on the study of of questions in percolation, on the design and analysis of randomized algorithms and derandomization techniques, and on applications of probabilistic ideas in the study of questions in Combinatorial Number Theory and in Combinatorial Geometry.

PARTICIPANTS

Alon, Noga (Tel Aviv), Balister, Paul (Memphis), Balogh, Jozsef (Urbana), Bohman, Thomas A. (Pittsburgh), Bollobas, Bela (Cambridge), Bukh, Boris (Cambridge), Coja-Oghlan, Amin (Coventry), Conlon, David (Cambridge), Czumaj, Artur (Coventry), Dietzfelbinger, Martin (Ilmenau), Fox, Jacob (Princeton), Frieze, Alan M. (Pittsburgh), Gal, Anna (Austin), Gerke, Stefanie (Surrey), Goerdt, Andreas (Chemnitz), Janson, Svante (Uppsala), Jerrum, Mark R. (London), Kahn, Jeff (New Brunswick), Kannan, Ravindran (Bangalore), Karonski, Michal (Poznan), Kohayakawa, Yoshiharu (Sao Paulo), Krause, Matthias (Mannheim), Krivelevich, Michael (Tel Aviv), Linial, Nathan (Jerusalem), Lubetzky, Eyal (Redmond), Luczak, Tomasz (Poznan), Matiyasevich, Yuri (St. Petersburg), Mehlhorn, Kurt (Saarbrücken), Miltersen, Peter Bro (Aarhus), Morris, Robert (Cambridge), Moser, Robin (Zürich), Nachmias, Asaf (Redmond), Pachon Pinzon, Angelica (Bielefeld), Prömel, Hans Jürgen (Darmstadt), Reischuk, Rüdiger (Lübeck), Riordan, Oliver M. (Oxford), Rucinski, Andrzej (Poznan), Scott, Alex (Oxford), Shapira, Asaf (Atlanta), Sorkin, Gregory B. (Yorktown Heights), Sos, Vera T. (Budapest), Steger, Angelika (Zürich), Sudakov, Benjamin (Los Angeles), Szemeredi, Endre (Piscataway), Taraz, Anusch (Garching bei München), Tardos, Gabor (Burnaby), Thomason, Andrew (Cambridge), Vöcking, Berthold (Aachen), Welzl, Emo (Zürich), Woelfel, Philipp (Calgary)

WORKSHOP 0919

03.05. - 09.05.2009 **Mathematical Biology**

Organisers: Emmanuele DiBenedetto, Nashville
Benoit Perthame, Paris
Angela Stevens, Heidelberg

ABSTRACT

Mathematical biology is a fast growing field of research, which on one hand side faces challenges resulting from the enormous amount of data provided by experimentalists in the recent years, on the other hand new mathematical methods may have to be developed to meet the demand for explanation and prediction on how specific biological systems function.

PARTICIPANTS

Alt, Wolfgang (Bonn), Ambrosi, Davide (Milano), Baake, Ellen (Bielefeld), Blesgen, Thomas (Leipzig), Bohmann, Ansgar (Heidelberg), Carrillo, Jose A. (Bellaterra (Barcelona)), Chapuisat, Guillemette (Marseille), Colin, Thierry (Talence), Czirok, Andras (Kansas City), DiBenedetto, Emmanuele (Nashville), Diekmann, Odo (Utrecht), Doumic-Jauffret, Marie (Le Chesnay), Efendiyev, Messoud (Neuherberg), Freistühler, Heinrich (Konstanz), Fuhrmann, Jan (Heidelberg), Gabriel, Pierre (Paris), Gruver, Scott (Nashville), Gwiazda, Piotr (Warsaw), Gyllenberg, Mats (University of Helsinki), Hadeler, Karl Peter (Tübingen), Hamel, Francois (Marseille), Horstmann, Dirk (Köln), Jäger, Willi (Heidelberg), Kang, Kyungkeun (Suwon), Kettemann, Anita (Stuttgart), Kirkilionis, Markus (Coventry), Lepoutre, Thomas (Paris), Mackey, Michael C. (Montreal), Marciniak-Czochra, Anna (Heidelberg), Mirrahimi, Sepideh (Paris), Mizerski, Jeremi (Warsaw), Müller, Johannes (Garching), Naldi, Giovanni (Milano), Neuss-Radu, Maria (Heidelberg), Othmer, Hans G. (Minneapolis), Perthame, Benoit (Paris), Primi, Ivano (Heidelberg), Raoul, Gael (Cachan), Robitzki, Andrea A. (Leipzig), Röger, Matthias (Dortmund), Schmeiser, Christian (Wien), Schmidt, Bernd (Garching bei München), Souganidis, Panagiotis E. (Chicago), Stevens, Angela (Heidelberg), Streichan, Sebastian (Heidelberg), Velazquez, Juan J. L. (Madrid), Weijer, Cornelis (Dundee)

10.05. - 16.05.2009 **Quadratic Forms and Linear Algebraic Groups**

Organisers: Detlev Hoffmann, Nottingham
Alexander S. Merkurjev, Los Angeles
Jean-Pierre Tignol, Louvain-la-Neuve

ABSTRACT

Topics discussed at the workshop Quadratic forms and linear algebraic groups included besides the algebraic theory of quadratic and Hermitian forms and their Witt groups several aspects of the theory of linear algebraic groups and homogeneous varieties, as well as some arithmetic aspects pertaining to the theory of quadratic forms over function fields over local fields.

PARTICIPANTS

Baeza, Ricardo (Talca), Bayer-Fluckiger, Eva (Lausanne), Becher, Karim Johannes (Konstanz), Berhuy, Gregory W. (Saint-Martin-d'Heres), Blunk, Mark (Los Angeles), Brosnan, Patrick (Vancouver), Calmes, Baptiste (Lens), Chernousov, Vladimir (Edmonton,), Colliot-Thelene, Jean-Louis (Orsay), Dolphin, Andrew (Konstanz), Fasel, Jean (Vancouver), Favi, Giordano (Basel), Florence, Mathieu (Paris), Garibaldi, Ryan Skip (Atlanta), Gille, Philippe (Paris), Gille, Stefan (München), Grenier-Boley, Nicolas (Mont Saint Aignan), Grimm, David (Konstanz), Hartmann, Julia (Aachen), Haution, Olivier (Paris), Hoffmann, Detlev (Nottingham), Hornbostel, Jens (Bonn), Karpenko, Nikita (Paris), Knebusch, Manfred (Regensburg), Knus, Max Albert (Zürich), Laghribi, Ahmed (Lens), Leep, David B. (Lexington), Lewis, David W. (Dublin), MacDonald, Mark (Vancouver), Malagon, Audrey (Macon), Merkurjev, Alexander S. (Los Angeles), Meyer, Aurel (Vancouver), Nenashev, Alexander (Toronto), Panin, Ivan (St. Petersburg), Parimala, Raman (Atlanta), Petrov, Viktor (Edmonton), Pfister, Albrecht (Mainz), Queguiner-Mathieu, Anne (Villetaneuse), Rühl, Klaas-Tido (Lausanne), Semenov, Nikita (München), Serre, Jean-Pierre (Paris), Sivatski, Alexander (St. Petersburg), Stavrova, Anastasia (St. Petersburg), Tignol, Jean-Pierre (Louvain-la-Neuve), Tikhonov, Sergey (Bellaterra), Unger, Thomas (Dublin), Vishik, Alexander (Nottingham), Vishne, Uzi (Ramat Gan), Wouters, Tim (Leuven), Zainoulline, Kirill (Ottawa)

WORKSHOP 0921

17.05. - 23.05.2009 **Topological and Variational Methods for Partial Differential Equations**

Organisers: Thomas Bartsch, Giessen
E. Norman Dancer, Sydney

ABSTRACT

The meeting was attended by 48 participants from 16 countries representing all continents (except Antarctica). In the 26 talks given during the course of the week, both leading experts and promising young mathematicians were invited to present recent trends and new developments in the field. Most of the talks dealt with nonlinear elliptic and parabolic equations, while special emphasis was laid on: Singularities and concentrating solutions, the interaction between PDE and geometry, Liouville type theorems, and symmetry and symmetry breaking.

PARTICIPANTS

Bates, Peter W. (East Lansing), Ben-Gal, Nitsan (Providence), Brock, Friedemann (Beirut), Clapp, Monica (Mexico), Dancer, E. Norman (Sydney), Esposito, Pierpaolo (Roma), Farina, Alberto (Amiens), Fiedler, Bernold (Berlin), Fila, Marek (Bratislava), Gazzola, Filippo (Milano), Ghoussoub, Nassif (Vancouver), Grunau, Hans-Christoph (Magdeburg), Gui, Changfeng (Storrs), Jeanjean, Louis (Besancon), Kawohl, Bernd (Köln), Kowalczyk, Michal (Santiago), Kunze, Markus (Essen), Madani, Farid (Paris), Malchiodi, Andrea (Trieste), Matano, Hiroshi (Tokyo), Montenegro, Marcelo (Campinas), Pacella, Filomena (Roma), Parini, Enea (Köln), del Pino, Manuel (Santiago), Pistoia, Angela (Roma), Polacik, Peter (Minneapolis), Quittner, Pavol (Bratislava), Reichel, Wolfgang (Karlsruhe), Ruiz, David (Granada), Schneider, Guido (Stuttgart), Schuricht, Friedemann (Dresden), Sirakov, Boyan (Nanterre), Souplet, Philippe (Villetaneuse), Stinner, Christian (Essen), Sweers, Guido H. (Köln), Szulkin, Andrzej (Stockholm), Tang, Zhongwei (Gießen), Tavares, Hugo Ricardo (Lisboa), Terracini, Susanna (Milano), Väth, Martin (Giessen), Warnault, Guillaume (Amiens), Waterstraat, Nils (Göttingen), Weth, Tobias (Frankfurt), Willem, Michel (Louvain-la-Neuve), Winkler, Michael (Essen), Winter, Matthias (Uxbridge), Yanagida, Eiji (Sendai), Yan, Shusen (Armidale)

24.05. - 30.05.2010 **Manifold Perspectives**

Organisers: Ian Hambleton, Hamilton
Erik K. Pedersen, Kobenhavn
Andrew Ranicki, Edinburgh
Holger Reich, Düsseldorf

ABSTRACT

The study of the global properties of manifolds and their symmetries has had a great impact on both geometric and algebraic topology, and also on other branches of mathematics, such as algebra, differential geometry and analysis. The purpose of the meeting was to bring together active researchers from diverse areas to discuss these exciting current perspectives on the topology of manifolds.

PARTICIPANTS

Adem, Alejandro (Vancouver), Arzhantseva, Goulnara N. (Geneve), Bartels, Arthur (Münster), Bartholdi, Laurent (Göttingen), Bunke, Ulrich (Regensburg), Castellana Vila, Natalia (Bellaterra), Chatterji, Indira (Orleans), Cortinas, Guillermo (Buenos Aires), Crowley, Diarmuid (Wayville), Davis, James F. (Bloomington), Ebert, Johannes (Bonn), Hambleton, Ian (Hamilton), Hanke, Bernhard (Garching), Harada, Megumi (Hamilton), Hausmann, Jean-Claude (Geneve), Henriques, Andre (Utrecht), Hoehn, Stacy (Notre Dame), Holm, Tara S. (Ithaca), Hughes, Bruce (Nashville), Januszkiewicz, Tadeusz (Columbus), Khan, Qayum (Notre Dame), Kreck, Matthias (Bonn), Kropholler, Peter H. (Glasgow), Lafont, Jean-Francois (Columbus), Lambrechts, Pascal (Louvain-la-Neuve), Laures, Gerd (Bochum), Leary, Ian J. (Columbus), Lenhardt, Fabian (Düsseldorf), Lück, Wolfgang (Münster), Macko, Tibor (Münster), Mineyev, Igor (Urbana), Nucinkis, Brita E.A. (Southampton), Pedersen, Erik Kjaer (Kobenhavn), Pitsch, Wolfgang (Bellaterra), Quinn, Frank S. (Blacksburg), Ramras, Daniel A. (Nashville), Randal-Williams, Oscar (Oxford), Ranicki, Andrew A. (Edinburgh), Reich, Holger (Düsseldorf), Rosenthal, David (Jamaica), Schick, Thomas (Göttingen), Singhof, Wilhelm (Düsseldorf), Su, Yang (Beijing), Ünlü, Özgün (Ankara), Ullmann, Mark (Düsseldorf), Vogtmann, Karen L. (Ithaca), Williams, E. Bruce (Notre Dame), Yalcin, Ergün (Bilkent, Ankara), Yu, Guoliang (Nashville)

WORKSHOP 0924

07.06. - 13.06.2009 **Strings, Fields and Topology**

Organisers: Dennis Sullivan, New York
Stephan Stolz, Notre Dame
Peter Teichner, Berkeley

ABSTRACT

In recent years, the interplay between traditional geometric topology and theoretical physics, in particular quantum field theory, has played a significant role in the work of many researchers. The idea of this workshop was to bring these people together so that the fields will be able to grow together in the future. Most of the talks were related to various flavors of field theories and differential cohomology theories.

PARTICIPANTS

Abbaspour, Hossein (Nantes), Bartlett, Bruce (Stellenbosch), von Bodecker, Hanno (Bochum), Bouwknegt, Peter G. (Canberra), Bunke, Ulrich (Regensburg), Chataur, David (Villeneuve d'Ascq), Cohen, Ralph L. (Stanford), Costello, Kevin (Evanston), Drummond-Cole, Gabriel (New York), Dumitrescu, Florin (Timisoara), Freed, Daniel S. (Austin), Grady, Ryan (Notre Dame), Grayshan, Katelyn (Notre Dame), Gwilliam, Owen (Evanston), Henriques, Andre (Utrecht), Hopkins, Mike J. (Cambridge), Kahle, Alexander (Göttingen), Kreck, Matthias (Bonn), Marathe, Kishore (Brooklyn), Meier, Lennart (Bonn), Morgan, John W. (Stony Brook), Olbermann, Martin (Berkeley), Pavlov, Dmitri (Berkeley), Poirier, Kate (New York), Prat-Waldron, Arturo (Berkeley), Ranicki, Andrew A. (Edinburgh), Redden, Corbett (Stony Brook), Richter, Birgit (Hamburg), Rounds, Nathaniel (Stony Brook), Runkel, Ingo (London), Sachse, Christoph (Austin), Schick, Thomas (Göttingen), Schommer-Pries, Chris (Cambridge), Schreiber, Urs (Hamburg), Schweigert, Christoph (Hamburg), Stimpson, Andrew J. (Stony Brook), Stolz, Stephan (Notre Dame), Sullivan, Michael (Amherst), Teichner, Peter (Bonn), Terilla, John (New York), Tillmann, Ulrike (Oxford), Tradler, Thomas (Brooklyn), Valentino, Alessandro (Göttingen), Waldorf, Konrad (Berkeley), Walker, Kevin (Santa Barbara), Wilson, Scott (Flushing), Wockel, Christoph (Göttingen), Wurzbacher, Tilmann (Metz), Zeinalian, Mahmoud (Brookville)

14.06. - 20.06.2009 **Computational Multiscale Methods**
Organisers: Carsten Carstensen, Berlin
Björn Engquist, Austin/Stockholm

ABSTRACT

Computational Multiscale Methods play an important role in many modern computer simulations in material sciences with different time scales and different scales in space. Besides various computational challenges, the meeting brought together various applications from many disciplines and scientists from various scientific communities.

PARTICIPANTS

Allix, Olivier (Cachan), Altmann, Robert (Berlin), Ascher, Uri M. (Vancouver), Balzani, Daniel (Hannover), Bartels, Sören (Bonn), Berlyand, Leonid (University Park), Caiazzo, Alfonso (Le Chesnay), Carstensen, Carsten (Berlin), Chen, Zhiming (Beijing), Dolzmann, Georg (Regensburg), Donev, Aleksandar (Livermore), Fedorov, Maxim V. (Leipzig), Hackbusch, Wolfgang (Leipzig), Hackl, Klaus (Bochum), Kornhuber, Ralf (Berlin), Legoll, Frederic (Marne la Vallee), Lin, Ping (Dundee), Löbhard, Caroline (Berlin), Luskin, Mitchell B. (Minneapolis), Malqvist, Axel (Uppsala), Ming, Pingbing (Beijing), Ortner, Christoph (Oxford), Park, Eun-Jae (Seoul), Peterseim, Daniel (Berlin), Plechac, Petr (Knoxville), Prohl, Andreas (Tübingen), Prudhomme, Serge (Austin), Ren, Weiqing (New York), Roubicek, Tomas (Praha), Samaey, Giovanni (Heverlee), Schröder, Jörg (Essen), Schwab, Christoph (Zürich), Sun, Yi (New York), Szepessy, Anders (Stockholm), Wriggers, Peter (Hannover), Yserentant, Harry (Berlin), Zeiser, Andreas (Berlin), Zhang, Pingwen (Beijing)

21.06. - 27.06.2009 **Algebraische Zahlentheorie**

Organisers: Guido Kings, Regensburg
Mark Kisin, Chicago
Otmar Venjakob, Heidelberg

ABSTRACT

The workshop brought together researchers from Europe, the US and Japan, who reported on various recent developments in algebraic number theory and related fields. Dominant themes were p-adic methods, L-functions and automorphic forms but other topics covered a very wide range of algebraic number theory.

PARTICIPANTS

Andreatta, Fabrizio (Milano), Bannai, Kenichi (Yokohama), Barth, Peter (Heidelberg), Berger, Laurent (Lyon), Böckle, Gebhard (Essen), Bouganis, Thanasis (Heidelberg), Bruinier, Jan Hendrik (Darmstadt), Bültel, Oliver (Bonn), Caruso, Xavier (Rennes), Chenevier, Gaetan (Palaiseau), Dalawat, Chandan Singh (Allahabad), Deninger, Christopher (Münster), Dokchitser, Vladimir (Cambridge), Dzambic, Amir (Frankfurt), Eisenreich, Sandra (Regensburg), Finis, Tobias (Düsseldorf), Flach, Matthias (Pasadena), Fontaine, Jean-Marc (Orsay), Gärtner, Jochen (Heidelberg), Geisser, Thomas (Los Angeles), Görtz, Ulrich (Essen), Goncharov, Alexander (Providence), Große-Klönne, Elmar (Berlin), Holschbach, Armin (Regensburg), Howard, Benjamin V. (Chestnut Hill), Huber-Klawitter, Annette (Freiburg), Jannsen, Uwe (Regensburg), Kakde, Mahesh (Princeton), Kerz, Moritz (Essen), Kings, Guido (Regensburg), Künnemann, Klaus (Regensburg), Naumann, Niko (Bonn), Niziol, Wieslawa (Salt Lake City), Ochiai, Tadashi (Osaka), van Order, Jeanine (Cambridge), Orlik, Sascha (Bonn), Pop, Florian (Philadelphia), Rubin, Karl (Irvine), Schmidt, Alexander (Regensburg), Schneider, Peter (Münster), Scholl, Anthony J. (Cambridge), Sharifi, Romyar (Hamilton), Stix, Jakob (Heidelberg), Venjakob, Otmar (Heidelberg), Viehmann, Eva (Bonn), Wedhorn, Torsten (Paderborn), Werner, Annette (Frankfurt am Main), Wingberg, Kay (Heidelberg), Wintenberger, Jean-Pierre (Strasbourg), Zhang, Shouwu (New York)

WORKSHOP 0927

28.06. - 04.07.2009 **Algebraic K-Theory and Motivic Cohomology**

Organisers: Thomas Geisser, Los Angeles
Annette Huber-Klawitter, Freiburg
Uwe Jannsen, Regensburg
Marc Levine, Boston

ABSTRACT

Algebraic K-theory and the related motivic cohomology are a systematic way of producing invariants for algebraic or geometric structures. Its definition and methods are taken from algebraic topology, but it has also proved particularly fruitful for problems of algebraic geometry, number theory or quadratic forms. 19 one-hour talks presented a wide range of results on K-theory itself and applications. We had a lively evening session trading questions and discussing open problems.

PARTICIPANTS

Arapura, Donu (West Lafayette), Ayoub, Joseph (Zürich), Balmer, Paul (Los Angeles), Barbieri Viale, Luca (Milano), Calmes, Baptiste (Lens), Cisinski, Denis-Charles (Villetaneuse), Cortinas, Guillermo (Buenos Aires), Deglise, Frederic (Villetaneuse), Enright-Ward, Stephen (Freiburg), Friedlander, Eric M. (Los Angeles), Gangl, Herbert (Durham), Geisser, Thomas (Los Angeles), Gerhardt, Teena M. (Bloomington), Gille, Stefan (München), Guillou, Bertrand (Urbana), Haesemeyer, Christian (Los Angeles), Holmstrom, Andreas (Cambridge), Hornbostel, Jens (Bonn), Huber-Klawitter, Annette (Freiburg), Ivorra, Florian (Rennes), Jannsen, Uwe (Regensburg), Jardine, John Frederick (London), de Jeu, Rob (Amsterdam), Kahn, Bruno (Paris), Kerz, Moritz (Essen), Kimura, Shun-Ichi (Higashi-Hiroshima), Levine, Marc (Boston), Lichtenbaum, Stephen (Providence), Mocanasu, Mona (Denver), Müller-Stach, Stefan (Mainz), Nenashev, Alexander (Toronto), Ostvar, Paul-Arne (Oslo), Panin, Ivan (St. Petersburg), Pelaez, Pablo (Essen), Ramdorai, Sujatha (Mumbai), Riou, Joel (Orsay), Röndigs, Oliver (Osnabrück), Rosenschon, Andreas (München), Rülling, Kay (Essen), Sato, Kanetomo (Nagoya), Schlichting, Marco (Baton Rouge), Schmidt, Alexander (Regensburg), Semenov, Nikita (München), Srinivas, Vasudevan (Mumbai), Totaro, Burt (Cambridge), Vishik, Alexander (Nottingham), Walker, Mark E. (Lincoln), Weibel, Charles A. (New Brunswick), Wendt, Matthias (Freiburg), Zhong, Changlong (Los Angeles)

WORKSHOP 0928

05.07. - 11.07.2009 **Dynamische Systeme**

Organisers: Hakan Eliasson, Paris
Helmut W. Hofer, New York
Jean-Christophe Yoccoz, Paris

ABSTRACT

This workshop, organized by Hakan Eliasson (Paris), Helmut Hofer (Princeton) and Jean-Christophe Yoccoz (Paris), continued the biannual series at Oberwolfach on Dynamical Systems that started as the "Moser–Zehnder meeting" in 1981. The workshop was attended by more than 50 participants from 12 countries. The main theme of the workshop were the new results and developments in the area of classical dynamical systems, in particular in celestial mechanics and Hamiltonian systems. Among the main topics were KAM theory in finite and infinite dimensions, and new developments in Floer homology (Rabinowitz-Floer homology).

PARTICIPANTS

Abbas, Casim (East Lansing), Abbondandolo, Alberto (Pisa), Albers, Peter (Zürich), Angenent, Sigurd B. (Madison), Avila, Artur (Paris), Bangert, Victor (Freiburg), Berger, Pierre (Bures-sur-Yvette), Bialy, Misha L. (Ramat-Aviv), Bjerklöv, Kristian (Stockholm), Bolotin, Sergey (Madison), Bramham, Barney (Leipzig), Chenciner, Alain (Paris), Cheritat, Arnaud (Toulouse), Eliasson, Hakan (Paris), Fejoz, Jacques (Paris), Fish, Joel (Stanford), Forni, Giovanni (College Park), Franks, John (Evanston), Ginzburg, Viktor L. (Santa Cruz), Gogolev, Andrey (University Park), Hasselblatt, Boris (Medford), Kaloshin, Vadim Y. (University Park), Katok, Anatole B. (University Park), Katok, Svetlana (University Park), Knauf, Andreas (Erlangen), Knieper, Gerhard (Bochum), Krikorian, Raphael (Paris), Kuperberg, Krystyna (Auburn), Levi, Mark (University Park), Lisi, Samuel (Stanford), Mather, John N. (Princeton), Matheus, Carlos (Paris), Momin, Al Saeed (Leipzig), Nowicki, Tomasz (Yorktown Heights), Pöschel, Jürgen (Stuttgart), Rabinowitz, Paul H. (Madison), Sauzin, David (Paris), Schlenk, Felix (Neuchatel), Schwarz, Matthias (Leipzig), Siburg, Karl Friedrich (Dortmund), Siefring, Richard (East Lansing), Tabachnikov, Serge (University Park), Wayne, Clarence Eugene (Boston), Wright, Paul (College Park), Wysocki, Krzysztof (University Park), Yoccoz, Jean-Christophe (Paris), Young, Lai-Sang (New York), Zehnder, Eduard (Zürich)

WORKSHOP 0929

12.07. - 18.07.2009 **Explicit Methods in Number Theory**
Organisers: Karim Belabas, Talence
Hendrik W. Lenstra, Leiden
Don B. Zagier, Bonn

ABSTRACT

These notes contain extended abstracts on the topic of explicit methods in number theory. The range of topics includes asymptotics for field extensions and class numbers, random matrices and L-functions, rational points on curves and higher-dimensional varieties, and aspects of lattice basis reduction.

PARTICIPANTS

Baran, Burcu (Roma), Bartel, Alex (Cambridge), Belabas, Karim (Talence), Bernstein, Daniel J. (Chicago), Bertolini, Massimo (Milano), Bhargava, Manjul (Princeton), Bright, Martin (Bristol), Bruin, Nils (Burnaby), Cohen, Henri (Talence), Colliot-Thelene, Jean-Louis (Orsay), Couveignes, Jean-Marc (Toulouse), Cremona, John E. (Coventry), Dalla Torre, Gabriele (RA Leiden), Darmon, Henri Rene (Montreal), Delaunay, Christophe (Villeurbanne), Dokchitser, Tim (Cambridge), Elkies, Noam D. (Cambridge), Fisher, Tom A. (Cambridge), Flynn, Eugene Victor (Oxford), Gangl, Herbert (Durham), Greenberg, Matthew (Calgary), Gunnells, Paul E. (Amherst), Klüners, Jürgen (Paderborn), Kohel, David R. (Marseille), Kolvraa, Anders (Bonn), Lauder, Alan G. B. (Oxford), Lenstra, Hendrik W. (Leiden), van Luijk, Ronald (Leiden), Matchett Wood, Melanie (Stanford), Poonen, Bjorn (Cambridge), Prasanna, Kartik (College Park), Putzka, Jens (Bonn), Ricotta, Guillaume (Talence), Roblot, Xavier-Francois (Villeurbanne), Rodriguez-Villegas, Fernando (Austin), Schoof, Rene (Roma), Siksek, Samir (Coventry), Simon, Denis (Caen), Skorobogatov, Alexei N. (London), de Smit, Bart (Leiden), Smith, Benjamin (Palaiseau), Stevenhagen, Peter (Leiden), Stolk, Arjen (Leiden), Stoll, Michael (Bayreuth), Streng, Marco (Leiden), Swinnerton-Dyer, Peter (Cambridge), Voight, John (Burlington), Watkins, Mark J. (Sydney), Zagier, Don B. (Bonn)

19.07. - 25.07.2010 **Mathematical Aspects of Hydrodynamics**

Organisers: Gregory Seregin, St. Petersburg
Vladimir Sverak, Minneapolis

ABSTRACT

The workshop was devoted to discussions of recent developments and possible future directions of research in the field of mathematical hydrodynamics. Many of the leading experts in the theory of PDE's arising in fluid dynamics participated in this event. The topics included: Regularity, uniqueness and well-posedness problems for the Navier-Stokes equations, Stability of Navier-Stokes solutions, Open problems concerning the steady-state Navier-Stokes solutions, Statistical approach to 2d hydrodynamics, Inviscid limits of Navier-Stokes solutions, Anomalous weak solutions of Euler's equation, Finding physically reasonable classes of weak solutions of Euler's equations, Local well-posedness of Euler's equations in optimal spaces, Stability of solutions of Euler's equations, Water waves, Model equations, Geometric approach to hydromechanical equations, and Selected compressible flow problems.

PARTICIPANTS

Bardos, Claude (Paris), Beirao da Veiga, Hugo (Pisa), Brenier, Yann (Nice), Caputo, Maria-Cristina (Austin), Chae, Dongho (Suwon), Cheskidov, Alexey (Chicago), Constantin, Peter (Chicago), De Lellis, Camillo (Zürich), Doering, Charles R. (Ann Arbor), Farwig, Reinhard (Darmstadt), Frehse, Jens (Bonn), Friedlander, Susan (Los Angeles), Fuchs, Martin (Saarbrücken), Galdi, Giovanni Paolo (Pittsburgh), Gallagher, Isabelle (Paris), Gallay, Thierry (Saint-Martin d'Heres), Hieber, Matthias (Darmstadt), Kiselev, Alexander (Madison), Koch, Gabriel (Chicago), Kozono, Hideo (Sendai), Lemarie-Rieusset, Pierre-Gilles (Evry), Lindblad, Hans (La Jolla), Mahalov, Alex (Tempe), Maremonti, Paolo (Caserta), Mikhaylov, Alexander (St. Petersburg), Muite, Benson K. (Ann Arbor), Pavlovic, Natasa (Austin), Pinto de Moura, Eleonora (Coventry), Pulvirenti, Mario (Roma), Ratiu, Tudor S. (Lausanne), Sawada, Okihiro (Darmstadt), Seregin, Gregory A. (Oxford), Shilkin, Timofey (St. Petersburg), Shkoller, Steve (Davis), Shnirelman, Alexander (Montreal), Shvydkoy, Roman (Chicago), Sohr, Hermann (Paderborn), Solonnikov, Vsevolod A. (St. Petersburg), Struwe, Michael (Zürich), Sverak, Vladimir (Minneapolis), Szekelyhidi, Laszlo (Bonn), Tani, Atusi (Yokohama), Taniuchi, Yasushi (Matsumoto), Titi, Edriss S. (Irvine), Vasseur, Alexis F. (Austin), Zajaczkowski, Wojciech M. (Warszawa), Zakharov, Vladimir E. (Moscow)

26.07. - 01.08.2009 **Differentialgeometrie im Großen**

Organisers: Olivier Biquard, Paris
Bernhard Leeb, München
Gang Tian, Princeton

ABSTRACT

The meeting continued the biannual conference series *Differentialgeometrie im Großen* at the MFO which was established in the 60's by Klingenberg and Chern. Global Riemannian geometry with its connections to geometric analysis, topology and geometric group theory is the guiding theme of the conference. Special emphasis was given to geometric structures on manifolds, the geometry of singular spaces, geometric evolution equations and the collapse of Riemannian manifolds.

PARTICIPANTS

Apostolov, Vestislav (Montreal), Bär, Christian (Potsdam), Ballmann, Werner (Bonn), Bamler, Richard (Princeton), Benoist, Yves (Orsay), Biquard, Olivier (Paris), Böhm, Christoph (Münster), Caputo, Maria-Cristina (Austin), Chang, Sun-Yung Alice (Princeton), Chen, Jingyi (Vancouver), Chen, Xiuxiong (Madison), Cortes, Vicente (Hamburg), Ghigi, Alessandro (Milano), Goette, Sebastian (Freiburg), Grossi-Ferreira, Carlos (Bonn), Guichard, Olivier (Orsay), Hamenstädt, Ursula (Bonn), Hein, Hans-Joachim (Princeton), Hensel, Sebastian (Bonn), Kremser, Robert (München), Lang, Urs (Zürich), Lebedeva, Nina (Münster), Leeb, Bernhard (München), Listing, Mario (Freiburg), Loftin, John (Newark), Lohkamp, Joachim (Münster), Lott, John (Berkeley), Marquis, Ludovic (Orsay), Mazzeo, Rafe (Stanford), Naber, Aaron (Cambridge), Nicklas, Daniel (München), Pacard, Frank (Creteil), Petrunin, Anton (Münster), Porti, Joan (Bellaterra), Ramos Cuevas, Carlos (München), Schroeder, Viktor (Zürich), Sesum, Natasa (New York), Taimanov, Iskander A. (Novosibirsk), Tian, Gang (Princeton), Viaclovsky, Jeff (Madison), Weber, Matthias (Bloomington), Weiss, Hartmut (München), Wienhard, Anna (Princeton), Wilking, Burkhard (Münster), Yang, Paul C. (Princeton), Ziller, Wolfgang (Philadelphia)

WORKSHOP 0932

02.08. - 08.08.2009 **Partielle Differentialgleichungen**

Organisers: Tom Ilmanen, Zürich
Reiner Schätzle, Tübingen
Neil Trudinger, Canberra
Georg S. Weiss, Tokyo

ABSTRACT

The workshop dealt with partial differential equations in geometry and technical applications. The main topics were the combination of nonlinear partial differential equations and geometric problems, regularity of free boundaries, conformal invariance and the Willmore functional. This meeting was well attended by 46 participants, including 3 females, with broad geographic representation. The program consisted of 17 talks and 6 shorter contributions and left sufficient time for discussions.

PARTICIPANTS

Alberti, Giovanni (Pisa), Blatt, Simon (Golm), Bögelein, Verena (Erlangen), Breuning, Patrick (Freiburg), Chang, Sun-Yung Alice (Princeton), Chanillo, Sagun (New Brunswick), Du, Shizhong (Canberra), Duzaar, Frank (Erlangen), Ecker, Klaus (Berlin), Ferone, Vincenzo (Napoli), Figalli, Alessio (Austin), Frehse, Jens (Bonn), Fusco, Nicola (Napoli), Grunau, Hans-Christoph (Magdeburg), Gursky, Matthew John (Notre Dame), Hildebrandt, Stefan (Bonn), Huisken, Gerhard (Golm), Ilmanen, Tom (Zürich), Kirchheim, Bernd (Düsseldorf), Koeller, Amos (Tübingen), Krylov, Nicolai V. (Minneapolis), Kuwert, Ernst (Freiburg), Liu, Jiakun (Canberra), Li, Yanyan (New Brunswick), Malchiodi, Andrea (Trieste), Martinazzi, Luca (Zürich), Mingione, Giuseppe R. (Parma), Müller, Reto (Pisa), Nadirashvili, Nikolai (Marseille), Otto, Felix (Bonn), Ould Ahmedou, Mohameden (Tübingen), Plotnikov, Pavel I. (Novosibirsk), Sauvigny, Friedrich (Cottbus), Schätzle, Reiner (Tübingen), Schygulla, Johannes (Freiburg), Struwe, Michael (Zürich), Tonegawa, Yoshihiro (Sapporo), Trombetti, Cristina (Napoli), Trudinger, Neil S. (Canberra), Varvaruca, Eugen (London), Villani, Cedric (Paris), Wang, Xu-Jia (Canberra), Weiss, Georg S. (Tokyo), Yang, Paul C. (Princeton)

WORKSHOP 0933

09.08. - 15.08.2009 **Linear and Nonlinear Eigenproblems for PDEs**

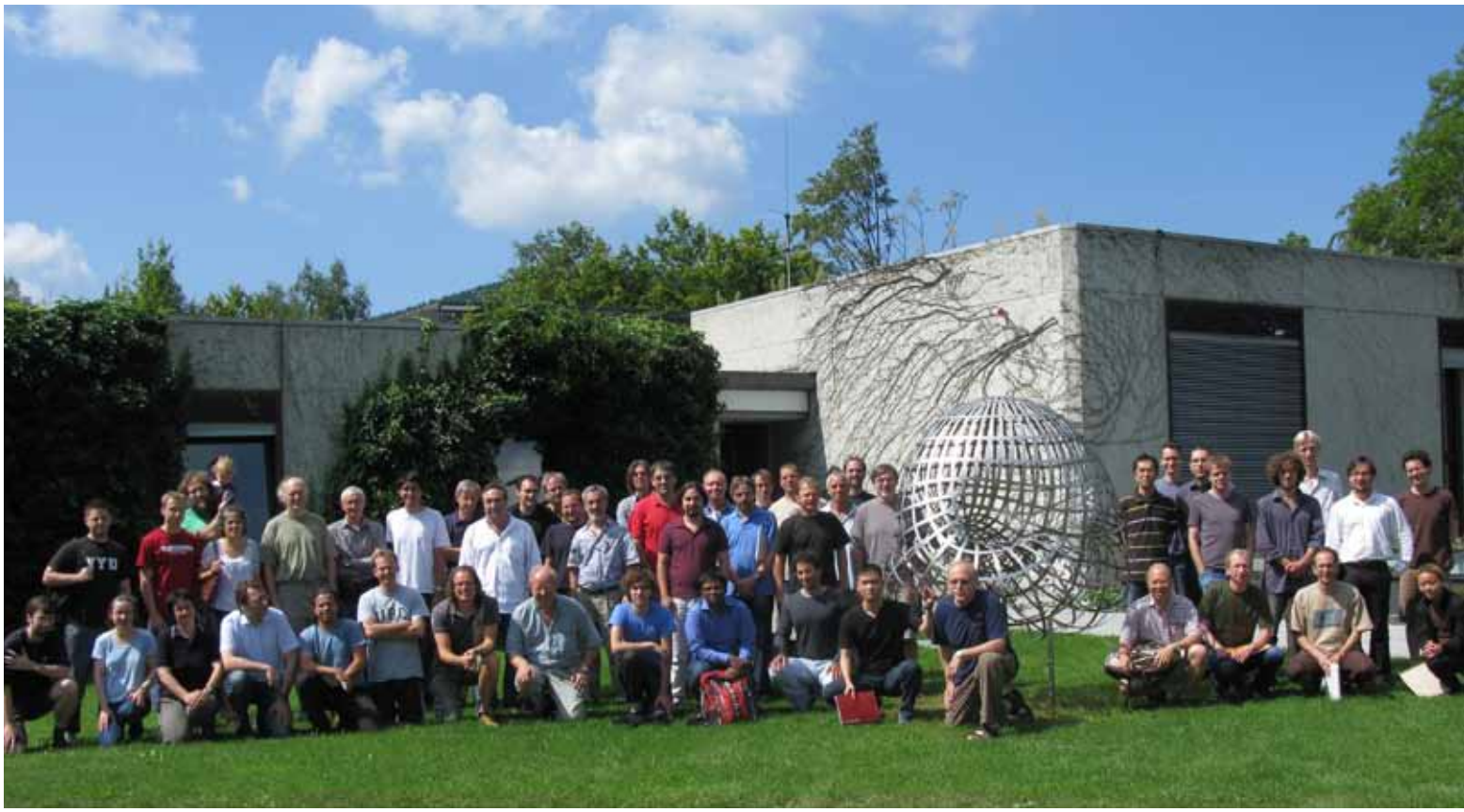
Organisers: Andrew Knyazev, Denver
Volker Mehrmann, Berlin
John Osborn, College Park
Jinchao Xu, University Park

ABSTRACT

The workshop discussed the numerical solution of linear and nonlinear eigenvalue problems for partial differential equations. It included the theoretical analysis the development of new (adaptive) methods, the iterative solution of the algebraic problems as well as the application in many areas of science and engineering.

PARTICIPANTS

Arbenz, Peter (Zürich), Banerjee, Uday (Syracuse), Benner, Peter (Chemnitz), Bennighof, Jeffrey K. (Austin), Benzi, Michele (Atlanta), Betcke, Marta M. (Manchester), Betcke, Timo (Reading), Brenner, Susanne C. (Baton Rouge), Carrington, Tucker (Kingston, Ontario), Carstensen, Carsten (Berlin), Embree, Mark (Houston), Fattebert, Jean-Luc (Livermore), Freitag, Melina (Bath), Gedicke, Joscha (Berlin), Giani, Stefano (Nottingham), Grasedyck, Lars (Leipzig), Grubisic, Luka (Zagreb), Hackbusch, Wolfgang (Leipzig), Hetmaniuk, Ulrich (Seattle), Hiptmair, Ralf (Zürich), Huang, Yunqing (Xiangtan), Knyazev, Andrew (Denver), Kressner, Daniel (Zürich), Larson, Mats G. (Umea), Lehoucq, Richard B. (Albuquerque), Meerbergen, Karl (Heverlee), Mehrmann, Volker (Berlin), Miedlar, Agnieszka (Berlin), Neymeyr, Klaus (Rostock), Notay, Yvan (Bruxelles), Osborn, John (College Park), Parlett, Beresford (Berkeley), Pasciak, Joseph E. (College Station), Plum, Michael (Karlsruhe), Rannacher, Rolf (Heidelberg), Rohwedder, Thorsten (Berlin), Schöberl, Joachim (Aachen), Sim, Imbo (Lausanne), Sorensen, Danny C. (Houston), Spence, Alastair (Bath), Strakos, Zdenek (Prague), Tisseur, Francoise (Manchester), Watkins, David S. (Pullman), Xu, Jinchao (University Park), Ye, Qiang (Lexington), Yserentant, Harry (Berlin), Zhou, Aihui (Beijing), Zschiedrich, Lin (Berlin)



16.08. - 22.08.2009 **Scaling Limits in Models of Statistical Mechanics**

Organisers: Kenneth Alexander, Los Angeles
Marek Biskup, Los Angeles
Remco van der Hofstad, Eindhoven
Vladas Sidoravicius, Rio d.J./Amsterdam

ABSTRACT

The workshop brought together researchers interested in spatial random processes and their connection to statistical mechanics. The principal subjects of interest were scaling limits and, in general, limit laws for various two-dimensional critical models, percolation, random walks in random environment, polymer models, random fields and hierarchical diffusions. The workshop fostered interactions between groups of researchers in these areas and led to interesting and fruitful exchanges of ideas.

PARTICIPANTS

Alexander, Kenneth (Los Angeles), Angel, Omer (Vancouver), Beffara, Vincent (Lyon), Berger, Noam (Jerusalem), van den Berg, Jacob (Amsterdam), Bhamidi, Shankar (Chapel Hill), Biskup, Marek (Los Angeles), Bodineau, Thierry (Paris), Bolthausen, Erwin (Zürich), Camia, Federico (Amsterdam), Chayes, Lincoln (Los Angeles), Damron, Michael (Princeton), Deuschel, Jean Dominique (Berlin), Duminil-Copin, Hugo (Geneve), van Enter, Aernout C.D. (AK Groningen), Gantert, Nina (Münster), Grimmett, Geoffrey R. (Cambridge), Heydenreich, Markus (Amsterdam), van der Hofstad, Remco (Eindhoven), den Hollander, Frank (Leiden), Holmes, Mark (Auckland), Hongler, Clement (Geneve), Hryniv, Ostap (Durham), Hulshof, Tim (Eindhoven), Ioffe, Dmitri (Haifa), Kotecky, Roman (Praha), Külske, Christof (Groningen), Kumagai, Takashi (Kyoto), van Leeuwaarden, Johann (Eindhoven), Lei, Helen (Los Angeles), Merkl, Franz (München), Mörters, Peter (Bath), Moreno, Gregorio (Paris), Newman, Charles (New York), Nolin, Pierre (New York), Ramirez, Alejandro F. (Santiago), Redig, Frank (Leiden), Rolla, Leonardo T. (Paris), Rolles, Silke (Garching), Sakai, Akira (Sapporo), Sapozhnikov, Artem (Amsterdam), Sasamoto, Tomohiro (Chiba), Sidoravicius, Vladas (Rio de Janeiro, RJ -), Soares dos Santos, Renato (Leiden), Trapman, Pieter (Amsterdam), Vares, Maria E. (Urca, Rio de Janeiro), Velenik, Yvan (Geneve), Werner, Wendelin (Orsay), Zygouras, Nikolaos (Coventry)

23.08. - 29.08.2009

Challenges in Statistical Theory:
Complex Data Structures and Algorithmic Optimization

Organisers: Rudolf J. Beran, Davis
Claudia Klüppelberg, München
Wolfgang Polonik, Davis

ABSTRACT

Technological developments have created a constant incoming stream of complex new data structures that need analysis. Modern statistics therefore means mathematically sophisticated new statistical theory that generates or supports innovative data-analytic methodologies for complex data structures. Inherent in many of these methodologies are challenging numerical optimization methods. The proposed workshop intends to bring together experts from mathematical statistics as well as statisticians involved in serious modern applications and computing. The primary goal of this meeting was to advance the mathematical and methodological underpinnings of modern statistics for complex data. Particular focus was given to: (multivariate) financial time series, scientific data analysis in neurosciences and bio-physics, estimation under shape constraints, and highdimensional discrimination/classification.

PARTICIPANTS

Anderes, Ethan (Davis), Anevski, Dragi (Lund), Beran, Rudolf (Davis), Birge, Lucien (Paris), Bühlmann, Peter (Zürich), Castro, Rui (New York), Czado, Claudia (Garching bei München), Davis, Richard A. (New York), Finner, Helmut (Düsseldorf), Genton, Marc (College Station), Greven, Sonja (Baltimore), Hothorn, Torsten (München), Huo, Xiaoming (Atlanta), Huskova, Marie (Praha), Klein, Thomas (Garching), Klüppelberg, Claudia (Garching), Kou, Samuel (Cambridge), Laber, Eric (Ann Arbor), Lindner, Alexander (Braunschweig), Ma, Yanyuan (College Station), Mason, David M. (Newark), Meinshausen, Nicolai (Oxford), Mikosch, Thomas (Copenhagen), Min, Aleksey (Garching), Mizera, Ivan (Edmonton,), Müller, Gernot (Garching), Müller, Klaus-Robert (Berlin), Munk, Axel (Göttingen), Murphy, Susan A. (Ann Arbor), Nowak, Robert (Madison), Paninski, Liam (New York), Podolskij, Mark (Zürich), Polonik, Wolfgang (Davis), Rao, Suhasini Subba (College Station), Reiß, Markus (Berlin), Ritov, Yaacov (Jerusalem), Saito, Naoki (Davis), Samworth, Richard (Cambridge), Sawitzki, Günther (Heidelberg), Schelldorfer, Jürg (Zürich), Schmidt-Hieber, Johannes (Göttingen), Seregin, Arseni (Seattle), Silverman, Bernard W. (Oxford), Spokoiny, Vladimir G. (Berlin), Stelzer, Robert (Garching bei München), Todorov, Viktor (Evanston), Tsybakov, Alexandre B. (Paris), Wellner, Jon A. (Seattle), Yao, Qiwei (London)

30.08. - 05.09.2009 **Mathematics of Complex Quantum Systems**

Organisers: Volker Bach, Mainz
Jean-Marie Barbaroux, Toulon
Lars Jonsson, Stockholm

ABSTRACT

A mathematical physics workshop focusing on the mathematics of complex quantum systems was held at MFO in September 2009. The physcs topics covered included quantum chemistry, nonrelativistic QED, statistical mechanics, random matrices and disordered systems, effective equations.

PARTICIPANTS

Aschbacher, Walter H. (Garching), Bach, Volker (Mainz), Barbaroux, Jean-Marie (La Garde), Betz, Volker (Coventry), Chen, Thomas (Austin), de Roeck, Wojciech (Heidelberg), Derezinski, Jan (Warszawa), Erdös, Laszlo (München), Esteban, Maria J. (Paris), Faupin, Jeremy (Talence), Frank, Rupert L. (Princeton), Friesecke, Gero (Garching bei München), Fröhlich, Jürg M. (Zürich), Gerard, Christian (Orsay), Germinet, Francois (Cergy-Pontoise), Graf, Gian Michele (Zürich), Griesemer, Marcel (Stuttgart), Guillot, Jean-Claude (Palaiseau), Hainzl, Christian (Birmingham), Hantsch, Fabian (Stuttgart), Hübener, Robert (Innsbruck), Jonsson, Lars (Stockholm), Joye, Alain (Saint-Martin d'Heres), Knörrer, Horst (Zürich), Koppen, Mario (Garching bei München), Lakaev, Saidakhmat (Samarkand), Langmann, Edwin (Stockholm), Lenzmann, Ralf-Enno (Copenhagen), Lewin, Mathieu (Cergy-Pontoise), Lieb, Elliott H. (Princeton), Matte, Oliver (München), Mück, Matthias (Darmstadt), Müller, Peter (München), Nier, Francis (Rennes), Pedra, Walter (Mainz), Pizzo, Alessandro (Davis), Salmhofer, Manfred (Heidelberg), Schenker, Jeffrey H. (East Lansing), Schlein, Benjamin (Bonn), Seiringer, Robert (Princeton), Siedentop, Heinz (München), Sigal, Israel Michael (Toronto), Solovej, Jan Philip (Kobenhavn), Teufel, Stefan (Tübingen), Ueltschi, Daniel (Coventry), Warzel, Simone (Garching bei München), Westrich, Matthias (Mainz), Yngvason, Jakob (Wien)

06.09. - 12.09.2009 **Noncommutative Geometry**

Organisers: Alain Connes, Paris
Joachim Cuntz, Münster
Marc A. Rieffel, Berkeley

ABSTRACT

Many of the different aspects of Noncommutative Geometry were represented in the talks. The list of topics that were covered includes in particular new insight into the geometry of a noncommutative torus, local index formulae in various situations, C*-algebras and dynamical systems associated with number theoretic structures, new methods in K-theory for noncommutative algebras as well as new progress in quantum field theory using concepts from noncommutative geometry.

PARTICIPANTS

Benameur, Moulay-Tahar (Metz), Bieliavsky, Pierre (Louvain-La-Neuve), Christensen, Erik (Kobenhavn), Connes, Alain (Bures-sur-Yvette), Consani, Caterina (Baltimore), Cuntz, Joachim (Münster), D'Andrea, Francesco (Louvain-la-Neuve), Dabrowski, Ludwik (Trieste), Daenzer, Calder (Berkeley), Echterhoff, Siegfried (Münster), Gorokhovsky, Alexander (Boulder), Grimstrup, Jesper M. (Kobenhavn), Gurau, Razvan (Waterloo), Hawkins, Eli (Heslington, York), Khalkhali, Masoud (London), Laca, Marcelo (Victoria), Landi, Giovanni (Trieste), Lesch, Matthias (Bonn), Li, Xin (Münster), Li, Hanfeng (Buffalo), Luef, Franz (Berkeley), Mesland, Bram (Utrecht), Meyer, Ralf (Göttingen), Moscovici, Henri (Columbus), Neshveyev, Sergey (Oslo), Nest, Ryszard (Kobenhavn), Nica, Bogdan (Victoria), O'Connor, Denjoe (Dublin), Otgonbayar, Uuye (Kobenhavn), Oyono-Oyono, Herve (Aubiere), Paravicini, Walther (Münster), Perrot, Denis (Villeurbanne), Piazza, Paolo (Roma), Plazas Vargas, Jorge A. (Utrecht), Puschnigg, Michael (Marseille), Rangipour, Bahram (Fredericton), Rave, Stephan (Münster), Rieffel, Marc A. (Berkeley), Rivasseau, Vincent (Orsay), Roe, John (University Park), Rosenberg, Jonathan M. (College Park), Schick, Thomas (Göttingen), Spakula, Jan (Münster), van Suijlekom, Walter D. (Nijmegen), Tang, Xiang (St. Louis), Thom, Andreas B. (Leipzig), Timmermann, Thomas (Münster), Voigt, Christian (Münster), Wulkenhaar, Raimar (Münster), Yao, Yi-Jun (University Park)

WORKSHOP 0938

13.09. - 19.09.2009 **PDE and Materials**

Organisers: John Ball, Oxford
Richard D. James, Minneapolis
Stefan Müller, Bonn

ABSTRACT

This meeting brought together an interesting and inspiring mix of mathematicians, physicists and material scientists, both theoreticians and experimentalists, to discuss new challenges for mathematics arising from materials science and the use of mathematical ideas in materials science. The talks and extensive informal discussions covered phenomena on all the relevant length scales, atomistic, mesoscopic and macroscopic, with particular emphasis and rigorous bridges between these scales.

PARTICIPANTS

Alberti, Giovanni (Pisa), Au Yeung, Yuen (Garching), Audoly, Basile (Paris), Ball, John M. (Oxford), Blesgen, Thomas (Leipzig), Conti, Sergio (Bonn), Dayal, Kaushik (Pittsburgh), DeSimone, Antonio (Trieste), Dirr, Nicolas (Bath), Dolzmann, Georg (Regensburg), Drautz, Ralf (Bochum), Francfort, Gilles (Villetaneuse), Garcia-Cervera, Carlos J. (Santa Barbara), Grabovsky, Yury (Philadelphia), Hackl, Klaus (Bochum), Henao Manrique, Duvan Alberto (Paris), Ignat, Radu (Orsay), James, Richard D. (Minneapolis), Kirchheim, Bernd (Düsseldorf), Knüpfer, Hans (New York), Kohn, Robert V. (New York), Kotecky, Roman (Praha), Legoll, Frederic (Marne la Vallee), Luckhaus, Stephan (Leipzig), Melcher, Christof (Aachen), Mora-Corral, Carlos (Derio (Vizcaya)), Müller, Stefan (Bonn), Muite, Benson K. (Ann Arbor), Neukamm, Stefan (Garching), Niethammer, Barbara (Oxford), Ortiz, Michael (Pasadena), Ortner, Christoph (Oxford), Otto, Felix (Bonn), Penrose, Oliver (Edinburgh), Planes, Antoni (Barcelona/Catalonia), Reina Romo, Celia (Pasadena), Salje, Ekhard K.H. (Cambridge), Schlömerkemper, Anja (Erlangen), Schmidt, Bernd (Garching bei München), Schryvers, Dominique (Antwerp), Seiner, Hanus (Praha), Stevens, Angela (Heidelberg), Süli, Endre (Oxford), Truskinovsky, Lev (Palaiseau), Vanden-Eijnden, Eric (New York), Wuttig, Manfred (College Park), Zwicknagl, Barbara (Bonn)

WORKSHOP 0939

20.09. - 26.09.2009 **Singularities**

Organisers: Andras Nemethi, Budapest
Duco van Straten, Mainz
Victor A. Vassiliev, Moscow

ABSTRACT

Local/global Singularity Theory is concerned with the local/global structure of maps and spaces that occur in differential topology or theory of algebraic or analytic varieties. It uses methods from algebra, topology, algebraic geometry and multi-variable complex analysis. The schedule of the meeting comprised 23 lectures of one hour each, presenting recent progress and interesting directions in singularity theory. Some of the talks gave an overview of the state of the art, open problems and new efforts and results in certain areas of the field.

PARTICIPANTS

A'Campo, Norbert (Basel), Altmann, Klaus (Berlin), de Bobadilla de Olazabal, Javier F. (Madrid), Bogner, Michael (Mainz), Borodzik, Maciej (Warszawa), Buchweitz, Ragnar-Olaf (Toronto), Burban, Igor (Bonn), Cadman, Paul (Coventry), Christophersen, Jan Arthur (Oslo), Cluckers, Raf (Leuven), Ebeling, Wolfgang (Hannover), Frühbis-Krüger, Anne (Hannover), Garay, Mauricio D. (Bures-sur-Yvette), Goryunov, Victor (Liverpool), Hertling, Claus (Mannheim), Ishii, Shihoko (Tokyo), Kazarian, Maxim E. (Moscow), Le, Cong Trinh (Kaiserslautern), Leenknegt, Eva (Heverlee), Lehn, Christian (Mainz), Lehn, Manfred (Mainz), Lemahieu, Ann (Leuven), Luengo, Ignacio (Madrid), Maxim, Laurentiu-G. (Madison), Melle Hernandez, Alejandro (Madrid), Mond, David (Coventry), Namikawa, Yoshinori (Kyoto), Nemethi, Andras (Budapest), Okuma, Tomohiro (Yamagata), Popescu-Pampu, Patrick (Paris), Reguera, Ana J. (Valladolid), Rimanyi, Richard (Chapel Hill), Sabbah, Claude (Palaiseau), Saito, Morihiko (Kyoto), Schepers, Jan (Heverlee), Schulze, Mathias (Stillwater), Schürmann, Jörg (Münster), Sevenheck, Christian (Mannheim), Siersma, Dirk (Utrecht), Stevens, Jan (Göteborg), van Straten, Duco (Mainz), Szilard, Agnes (Budapest), Takahashi, Atsushi (Osaka), Teissier, Bernard (Paris), Vassiliev, Victor A. (Moscow), Veys, Wim (Leuven)

WORKSHOP 0940

27.09. - 03.10.2009 **Complex Algebraic Geometry**

Organisers: Fabrizio Catanese, Bayreuth
Yujiro Kawamata, Tokyo
Gang Tian, Princeton
Eckart Viehweg, Essen

ABSTRACT

The Conference focused on several classical and novel theories in the realm of complex algebraic geometry, such as Algebraic surfaces, Moduli theory, Minimal Model Program, Abelian Varieties, Holomorphic Symplectic Varieties, Homological algebra, Kähler manifolds theory, Holomorphic dynamics, Quantum cohomology.

PARTICIPANTS

Viehweg, Eckart (Essen), Bauer-Catanese, Ingrid (Bayreuth), Birkar, Caucher (Cambridge), Campana, Frederic (Vandoeuvre-les-Nancy), Catanese, Fabrizio (Bayreuth), Chan, Mario (Bayreuth), Chatzistamatiou, Andre (Essen), Corti, Alessio (London), Debarre, Olivier (Paris), Dedieu, Thomas (Toulouse), Ein, Lawrence (Chicago), Esnault, Helene (Essen), Farkas, Gavril (Berlin), Frantzen, Kristina (Bayreuth), van der Geer, Gerard (Amsterdam), Hulek, Klaus (Hannover), Ishii, Akira (Hiroshima), Kawamata, Yujiro (Tokyo), Kirschner, Tim (Bayreuth), Kovacs, Sandor (Seattle), Lazarsfeld, Robert (Ann Arbor), Li, Jun (Stanford), Liu, Wenfei (Bayreuth), Lönne, Michael (Bayreuth), Miyaoka, Yoichi (Tokyo), Möller, Martin (Bonn), Mukai, Shigeru (Kyoto), Mustata, Mircea (Ann Arbor), Nakaoka, Hiroyuki (Tokyo), Namikawa, Yoshinori (Kyoto), Nguyen, Duy-Tan (Essen), Oguiso, Keiji (Osaka), Pardini, Rita (Pisa), Paul, Sean T. (Madison), Penegini, Matteo (Bayreuth), Perroni, Fabio (Bayreuth), Peternell, Thomas M. (Bayreuth), Pignatelli, Roberto (Trento), Pumperla, Max (Hamburg), Rohde, Jan Christian (Hannover), Rollenske, Sönke (Bonn), Rülling, Kay (Essen), Sano, Taro (Tokyo), Schreyer, Frank-Olaf (Saarbrücken), Schröer, Stefan (Düsseldorf), Syzdek, Wioletta (Essen), Tian, Gang (Princeton), Totaro, Burt (Cambridge), Zhang, Zhou (Ann Arbor)

11.10. - 17.10.2009 **Mathematical Aspects of General Relativity**

Organisers: Piotr Chrusciel, Tours/Oxford
James Isenberg, Eugene
Alan Rendall, Golm

ABSTRACT

Mathematical relativity, the subject of this conference, has recently become more and more devoted to the theory of nonlinear evolution equations, with global questions becoming ever more accessible. This is reflected by the fact that more than half of the talks given were concerned with the global dynamics of solutions of evolution equations related more or less directly to the Einstein equations of general relativity. Progress was reported in understanding subjects such as black holes, gravitational radiation, cosmology and the relation of general relativity to Newtonian gravitational theory.

PARTICIPANTS

Alexakis, Spiros (Cambridge), Allen, Paul Tyler (Portland), Anderson, Michael T. (Stony Brook), Andreasson, Hakan (Göteborg), Barbos, Aneta (Golm), Bartnik, Robert (Clayton), Beig, Robert (Wien), Bieli, Roger (Golm), Bieri, Lydia (Cambridge), Bizon, Piotr (Krakow), Blue, Pieter (Edinburgh), Chrusciel, Piotr T. (Tours), Cortier, Julien (Montpellier), Corvino, Justin (Easton), Dafermos, Mihalis (Cambridge), Dain, Sergio (Cordoba), Delay, Erwann (Avignon), Fiedler, Bernold (Berlin), Finster, Felix (Regensburg), Friedrich, Helmut (Golm), Galloway, Gregory (Coral Gables), Heinzle, Mark (Wien), Hennig, Jörg (Golm), Holst, Michael (La Jolla), Holzegel, Gustav (Princeton), Huisken, Gerhard (Golm), Isenberg, James (Eugene), Klawonn, David (Golm), LeFloch, Philippe G. (Paris), Mars, Marc (Salamanca), Maxwell, David (Fairbanks), Mazzeo, Rafe (Stanford), Metzger, Jan (Golm), Miao, Pengzi (Clayton), Oliynyk, Todd (Clayton), Pacard, Frank (Creteil), Rein, Gerhard (Bayreuth), Rendall, Alan (Golm), Schmidt, Bernd (Potsdam), Smulevici, Jacques (Cambridge), Speck, Jared (Princeton), Struwe, Michael (Zürich), Szpak, Nikodem (Duisburg), Tataru, Daniel (Berkeley), Tsogtgerel, Gantumur (Montreal), Velazquez, Juan J. L. (Madrid), Williams, Catherine (Stanford)

WORKSHOP 0944a

25.10. - 31.10.2009 **History and Philosophy of Mathematical Notations and Symbolism**

Organisers: Karine Chemla, Paris
Eberhard Knobloch, Berlin
Antoni Malet, Barcelona

ABSTRACT

The conference aimed to discuss the nature of mathematical language with the focus set on the history of mathematical symbolism and symbolisation in a wide sense. Its contents were arranged along three main topics–symbolization from Mesopotamian, Egyptian, Greek, Latin, Indian and Chinese perspectives; algebraic analysis and symbolization in Europe, 1500-1750; the 19th and 20th century. The intention was to deal with the topic extensively, including all kinds of symbolism shaped in various traditions. Major problems addressed by the conference include but are not limited to why specific notations and symbolisms were introduced, how they were designed and how they were used. In addition, the lectures also dealt with the attitudes towards, and reflections on, mathematics and language that their introduction stirred. We hope that the workshop will contribute to shape future research in this domain.

PARTICIPANTS

Bos, Henk J. M. (Aarhus), Breard, Andrea (Villeneuve d'Ascq.), Chemla, Karine (Paris), Chorlay, Renaud (Paris), de Risi, Vincenzo (Berlin), Ehrhardt, Caroline (Paris), Epple, Moritz (Frankfurt am Main), Hoyrup, Jens (Roskilde), Imhausen, Annette (Frankfurt), Keller, Agathe (Paris), Knobloch, Eberhard (Berlin), Kobayashi, Tatsuhiko (Gunma), Kvasz, Ladislav (Bratislava), Lee, Chia-Hua (Tokyo), Malet, Antoni (Barcelona), Maronne, Sebastien (Chamalieres), Massa Esteve, Rosa (Barcelona), Miao, Tian (Beijing), Mota, Bernardo (Berlin), Ossendrijver, Mathieu (Tübingen), Pan, Li Yun (Berlin), Panza, Marco (Paris), Rabouin, David (Paris), Radelet-de Grave, Patricia (Louvain-la-Neuve), Shank, John Bennett (Minneapolis)

WORKSHOP 0945

01.11. - 07.11.2009 **Design and Analysis of Infectious Disease Studies**

Organisers: Martin Eichner, Tübingen
Elizabeth Halloran, Seattle
Philip O'Neill, Nottingham

ABSTRACT

This workshop gathered 45 participants from 16 countries and had a correspondingly multifaceted program covering various infectious diseases, public health applications, and methodological innovations. The discussions and presentations focused on the importance of mathematical models and statistical analyses in understanding the complex transmission systems of infectious diseases and in planning effective intervention strategies. Many different statistical and mathematical approaches were covered. The general unifying theme is that the analyses and models take into account the underlying transmission of the infectious agent among the hosts and/ or vector populations.

PARTICIPANTS

Auranen, Kari (Helsinki), Ball, Frank G. (Nottingham), Bootsma, Martin (Utrecht), van Boven, Michiel (Bilthoven), Britton, Tom (Stockholm), Dietz, Klaus (Tübingen), Dürr, Hans-Peter (Tübingen), Eichner, Martin (Tübingen), Farrington, Conor Patrick (Milton Keynes), Ford, Ashley (Coventry), Gibson, Gavin (Edinburgh), Goeyvaerts, Nele (Diepenbeek), Gomes, Gabriela M. (Oeiras), Halloran, M. Elizabeth (Seattle), Hens, Niel (Diepenbeek), Isham, Valerie S. (London), Kenah, Eben E. (Seattle), Koopman, Jim (Ann Arbor), Kretzschmar, Mirjam (BA Bilthoven), Kypraios, Theodore (Nottingham), Le Thi Thanh, An (Heidelberg), Lindholm, Mathias (Uppsala), Longini, Ira M. (Seattle), McBryde, Emma (Melbourne), Melegaro, Alessia (Milano), Mollison, Denis (Musselburgh), Nagelkerke, Nico J.D. (AL Ain), Neal, Peter (Manchester), Nishiura, Hiroshi (Utrecht), O'Neill, Philip D. (Nottingham), Pellis, Lorenzo (London), Roberts, Mick (Auckland), Sattenspiel, Lisa (Columbia), Scalia-Tomba, Gianpaolo (Roma), Schönfisch, Birgitt (Tübingen), Schwehm, Markus (Leinfelden), Spencer, Simon (Nottingham), Stauch, Anette (Tübingen), Struchiner, Claudio J. (Rio de Janeiro), Svensson, Ake (Stockholm), Trapman, Pieter (Amsterdam), Vänskä, Simopekka (Helsinki), Volz, Erik M. (Ann Arbor), Yang, Yang (Seattle), Ziach, Anna (Tübingen)

WORKSHOP 0947

15.11. - 21.11.2009 **Complexity Theory**

Organisers: Peter Bürgisser, Paderborn
Joachim von zur Gathen, Bonn
Oded Goldreich, Rehovot
Madhu Sudan, MIT Cambridge

ABSTRACT

Computational Complexity Theory is the mathematical study of the intrinsic power and limitations of computational resources like time, space, or randomness. The current workshop focused on recent developments in various sub-areas including arithmetic complexity, Boolean complexity, communication complexity, cryptography, probabilistic proof systems, pseudorandomness, and quantum computation. Many of the developements are related to diverse mathematical fields such as algebraic geometry, combinatorial number theory, probability theory, quantum mechanics, representation theory, and the theory of error-correcting codes.

PARTICIPANTS

Aaronson, Scott (Cambridge), Arora, Sanjeev (Princeton), Austrin, Per (New York), Barak, Boaz (Princeton), Beame, Paul (Seattle), Bläser, Markus (Saarbrücken), Blömer, Johannes (Paderborn), Braverman, Mark (Cambridge), Bürgisser, Peter (Paderborn), Cucker, Felipe (Kowloon Tong), Dinur, Irit (Rehovot), Dvir, Zeev (Princeton), Efremenko, Klim (Tel Aviv), von zur Gathen, Joachim (Bonn), Goldreich, Oded (Rehovot), Guruswami, Venkatesan (Pittsburgh), Haitner, Iftach Ilan (Cambridge), Hastad, Johan (Stockholm), Ikenmeyer, Christian (Paderborn), Impagliazzo, Russell (La Jolla), Kabanets, Valentine (Burnaby), Khot, Subhash A. (New York), Koiran, Pascal (Lyon), Kopparty, Swastik (Cambridge), Krause, Matthias (Mannheim), Lovett, Shachar (Rehovot), Meir, Or (Rehovot), Meyer auf der Heide, Friedhelm (Paderborn), Mie, Thilo (Karlsruhe), Moshkovitz, Dana (Princeton), Pudlak, Pavel (Praha), Raghavendra, Prasad (Seattle), Rao, Anup (Seattle), Reingold, Omer (Rehovot), Reischuk, Rüdiger (Lübeck), Rossman, Benjamin (Cambridge), Saraf, Shubhangi (Cambridge), Schnorr, Claus-Peter (Frankfurt), Schöning, Uwe (Ulm), Shaltiel, Ronen (Haifa), Shpilka, Amir (Haifa), Sudan, Madhu (Cambridge), Umans, Chris (Pasadena), Vadhan, Salil (Cambridge), Valiant, Leslie G. (Cambridge), Viola, Emanuele (Boston), Wigderson, Avi (Princeton), Yehudayoff, Amir (Princeton)

WORKSHOP 0949

29.11. - 05.12.2009 **Convex Geometry and its Applications**

Organisers: Keith Ball, London
Martin Henk, Magdeburg
Monika Ludwig, New York

ABSTRACT

The geometry of convex domains in Euclidean space plays a central role in several branches of mathematics: functional and harmonic analysis, the theory of PDE, linear programming and, increasingly, in the study of other algorithms in computer science. High-dimensional geometry, both the discrete and convex branches of it, has experienced a striking series of developments in the past 10 years. Several examples were presented at this meeting, for example the work of Rudelson et al. on conjunction matrices and their relation to confidential data analysis, that of Litvak et al. on remote sensing and a series of results by Nazarov and Ryabogin et al. on Mahler's conjecture for the volume product of domains and their polars.

PARTICIPANTS

Alonso-Gutierrez, David (Zaragoza), Ambrus, Gergely (Budapest), Aubrun, Guillaume (Villeurbanne), Ball, Keith M. (London), Barany, Imre (Budapest), Barthe, Franck (Toulouse), Barvinok, Alexander (Ann Arbor), Bastero, Jesus (Zaragoza), Berck, Gautier (Fribourg), Bernig, Andreas (Frankfurt), Bianchi, Gabriele (Firenze), Bianchini, Chiara (Firenze), Böröczky, Jr., Karoly (Budapest), Colesanti, Andrea (Firenze), Dafnis, Nikos (Athens), Fradelizi, Matthieu (Marne-La-Vallee), Gardner, Richard J. (Bellingham), Giannopoulos, Apostolos A. (Athens), Goodey, Paul R. (Norman), Gruber, Peter M. (Wien), Guedon, Olivier (Marne-La-Vallee), Haberl, Christoph (Brooklyn), Henk, Martin (Magdeburg), Hernandez Cifre, Maria A. (Espinardo, MURCIA), Hug, Daniel (Karlsruhe), Koldobsky, Alexander (Columbia), Larman, David G. (London), Lehec, Joseph (Marne-La-Vallee), Litvak, Alexander (Edmonton, Alberta), Ludwig, Monika (Brooklyn), Lutwak, Erwin (Brooklyn), McMullen, Peter (London), Netuka, Ivan (Praha), Pajor, Alain (Marne-la-Vallee), Paouris, Grigoris (College Station), Peri, Carla (Milano), Petrov, Fedor (St. Petersburg), Rademacher, Luis (Columbus), Reitzner, Matthias (Osnabrück), Rudelson, Mark (Columbia), Ryabogin, Dmitry (Kent), Saorin, Eugenia (Magdeburg), Schneider, Rolf (Freiburg), Schuster, Franz (Wien), Schütt, Carsten (Kiel), Stancu, Alina (Montreal), Volcic, Aljosa (Arcavacata di Rende (CS)), Weil, Wolfgang (Karlsruhe), Werner, Elisabeth (Cleveland), Yaskin, Vlad (Edmonton), Zvavitch, Artem (Kent)

WORKSHOP 0951

13.12. - 19.12.2009 **Material Theories**

Organisers: Antonio DeSimone, Trieste
Stephan Luckhaus, Leipzig
Lev Truskinovsky, Palaiseau

ABSTRACT

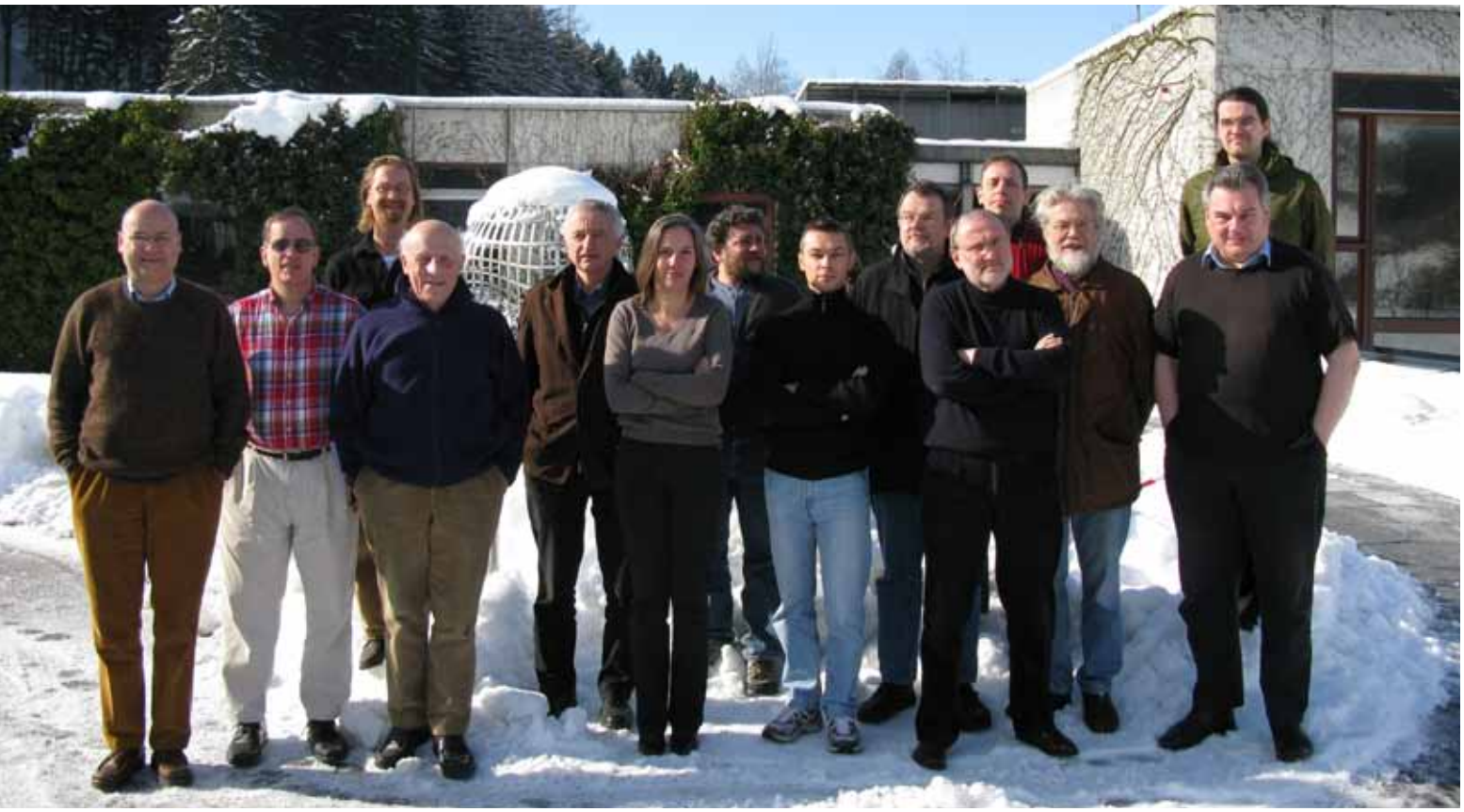
This biennial workshop brings together mathematicians, mechanicians and theoretical physicists interested in developing new mathematical models of complex materials, medias and systems. The workshop covers a wide range of topics from nonequilibrium statistical mechanics and dynamical systems to calculus of variations and nonlinear functional analysis. A particular focus of this meeting was on continuum description of biological systems, pattern formation, granular media, plasticity and turbulence.

PARTICIPANTS

Agostiniani, Virginia (Trieste), Alberti, Giovanni (Pisa), Alt, Hans Wilhelm (Bonn), Berdichevsky, Victor (Detroit), Bigoni, Davide (Trento), Bonilla, Luis L. (Leganes), Bouchitte, Guy (La Garde), Brenier, Yann (Nice), Cardamone, Luca (Trieste), Carpio, Ana Maria (Madrid), Cermelli, Paolo (Torino), Chambolle, Antonin (Palaiseau), DeSimone, Antonio (Trieste), Di Carlo, Antonio (Roma), Dirr, Nicolas (Bath), Dondl, Patrick W. (Bonn), Epstein, Marcelo (Calgary), Fedeli, Livio (Trieste), Garroni, Adriana (Roma), Grabovsky, Yury (Philadelphia), Heltai, Luca (Trieste), Herrmann, Hans (Zürich), Joanny, Jean-Francois (Paris), Jülicher, Frank (Dresden), Kruse, Karsten (Saarbrücken), Kucher, Vladislav (Palaiseau), Kuksin, Sergei (Palaiseau), Le, Khanh Chau (Bochum), Lewicka, Marta (Minneapolis), Luckhaus, Stephan (Leipzig), Marrucci, Giuseppe (Napoli), Mielke, Alexander (Berlin), Müller, Ingo (Berlin), Mugnai, Luca (Leipzig), Neukamm, Stefan (Garching), Neukirch, Sebastien (Paris), Olla, Stefano (Paris), Ortiz, Michael (Pasadena), Peletier, Mark A. (Eindhoven), Perez-Reche, Francisco-Jose (Cambridge), Recho, Pierre (Palaiseau), Salman, Oguz Umut (Palaiseau), Schlichting, Andre (Leipzig), Schmidt, Bernd (Garching bei München), Theil, Florian (Coventry), Truskinovsky, Lev (Palaiseau), Vainchtein, Anna (Pittsburgh), Wohlgemuth, Jens (Leipzig), Zanzotto, Giovanni (Padova)

2.4. Miniworkshops

MINIWORKSHOP 0908a



15.02. - 21.02.2009 **Category Theory and Related Fields: History and Prospects**

Organisers: Ralf Krömer, Nancy
Colin McLarty, Cleveland
Michael Wright, Fougeres

ABSTRACT

By evaluating the history of category theory and related fields, the workshop aimed at continuing and broadening a historical study initiated by the late Saunders Mac Lane some 15 years ago in a short paper. Most of the participants of the workshop are historians of mathematics having contributed to the historiography of category theory itself or one of its fields of application. But we hosted as well some leading mathematicians concerned with the development of category-theoretic tools in the various fields, in order to discuss, still in a line with Mac Lane's contribution, not only past but also recent, ongoing and possible future developments.

PARTICIPANTS

Ageron, Pierre (Caen), Awodey, Steve (Pittsburgh), Carter, Jessica (Odense), Cartier, Pierre (Bures-sur-Yvette), Chorlay, Renaud (Vincennes), Gekeler, Ernst-Ulrich (Saarbrücken), Krömer, Ralf (Siegen), Marquis, Jean-Pierre (Montreal), McLarty, Colin (Cleveland), Schapira, Pierre (Paris), Schappacher, Norbert (Strasbourg), Scholz, Erhard (Wuppertal), Volkert, Klaus (Wuppertal), Wright, Michael (Fougeres)

MINIWORKSHOP 0908b

15.02. - 21.02.2009 **Product Systems and Independence in Quantum Dynamics**

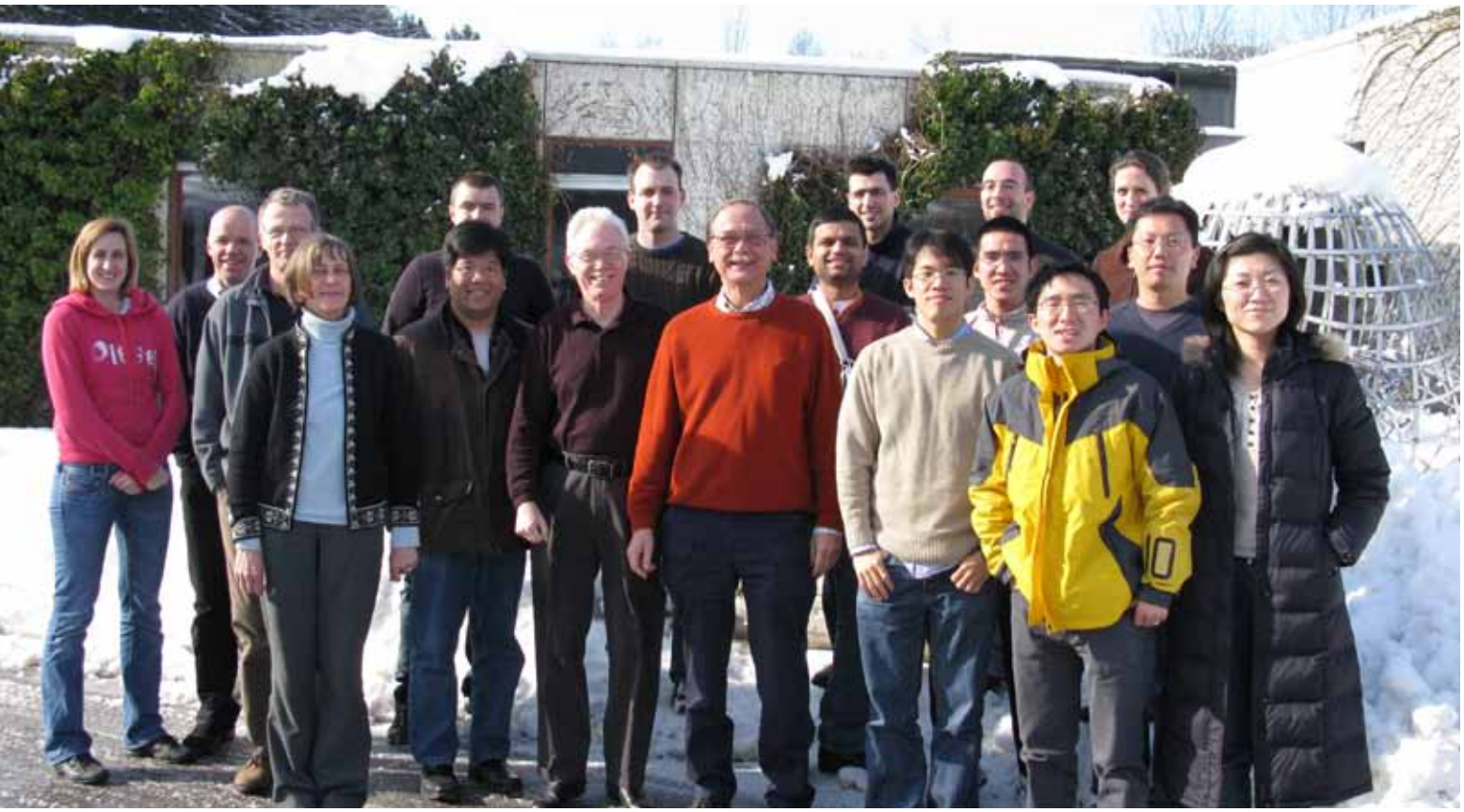
Organisers: B.V. Rajarama Bhat, Bangalore
Uwe Franz, Besancon/Sendai
Michael Skeide, Campobasso

ABSTRACT

Quantum dynamics, both reversible (i.e., closed quantum systems) and irreversible (i.e., open quantum systems), gives rise to product systems of Hilbert spaces or, more generally, of Hilbert modules. When we consider reversible dynamics that *dilates* an irreversible dynamics, then the product system of the latter is equal to the product system of the former (or is contained in a unique way). Whenever the dynamics is on a proper subalgebra of the algebra of all bounded operators on a Hilbert space, in particular, when the open system is classical (commutative) it is indispensable that we use Hilbert modules. The product system of a reversible dynamics is intimately related to a filtration of subalgebras that are independent in a state or conditionally independent in a conditional expectation of the reversible system. This has been illustrated in many concrete dilations that have been obtained with the help of quantum stochastic calculus. Here the underlying Fock space or module determines the sort of quantum independence underlying the reversible system. The mini-workshop brought together experts from quantum dynamics, product systems and quantum independence who have contributed to the general theory or who have studied intriguing examples. As the implications of the tight relationship between product systems and independence had so far been largely neglected, we expect from our mini-workshop a strong innovative impulse to this field.

PARTICIPANTS

Accardi, Luigi (Roma), Bhat, B.V. Rajarama (Bangalore), Fagnola, Franco (Milano), Floricel, Remus (Regina), Franz, Uwe (Besancon), Izumi, Masaki (Kyoto), Koestler, Claus (Canton), Liebscher, Volkmar (Greifswald), Lindsay, J. Martin (Lancaster), Schürmann, Michael (Greifswald), Shalit, Orr (Haifa), Sinha, Kalyan Bidhan (Bangalore), Skalski, Adam (Lancaster), Skeide, Michael (Campobasso), Tsirelson, Boris (Tel Aviv), von Waldenfels, Wilhelm (Heidelberg)



15.02. - 21.01.2009 **Support Varieties**

Organisers: Karin Erdmann, Oxford
Henning Krause, Paderborn

ABSTRACT

The notion of support is a fundamental concept which provides a geometric approach for studying various algebraic structures. The prototype for this has been Quillen's description of the algebraic variety corresponding to the cohomology ring of a finite group, based on which Carlson introduced support varieties for modular representations. This has made it possible to apply methods of algebraic geometry to obtain representation theoretic information. Their work has inspired the development of analogous theories in various contexts, notably modules over commutative complete intersection rings, and over cocommutative Hopf algebras. The aim of this workshop has been to bring together experts from these fields and to stimulate interaction and exchange of ideas.

PARTICIPANTS

Bergh, Petter (Trondheim), Buchweitz, Ragnar-Olaf (Toronto), Carlson, Jon F. (Athens), Chen, Xiao-Wu (Paderborn), Dell'Ambrogio, Ivo (Singapore), Erdmann, Karin (Oxford), Hemmer, David (Buffalo), Iyengar, Srikanth B. (Lincoln), Krause, Henning (Bielefeld), Lim, Kay-Jin (Aberdeen), Mikaelian, Aram (Oxford), Nakano, Daniel K. (Athens), Scherotzke, Sarah (Paris), Solberg, Oeyvind (Trondheim), Xu, Fei (Paderborn)

MINIWORKSHOP 0910a

01.03. - 07.03.2009 **Numerical Upscaling for Flow Problems: Theory and Applications**

Organisers: Achi Brandt, Rehovot
Yalchin Efendiev, College Station
Oleg Iliev, Kaiserslautern

ABSTRACT

The objective of this workshop was to bring together researchers working in multiscale simulations with emphasis on multigrid methods and multiscale finite element methods, aiming at chieving of better understanding and synergy between these methods. The goal of multiscale finite element methods, as upscaling methods, is to compute coarse scale solutions of the underlying equations as accurately as possible. On the other hand, multigrid methods attempt to solve fine-scale equations rapidly using a hierarchy of coarse spaces. Multigrid methods need "good" coarse scale spaces for their efficiency. The discussions of this workshop partly focused on approximation properties of coarse scale spaces and multigrid convergence. Some other presentations were on upscaling, domain decomposition methods and nonlinear multiscale methods. Some researchers discussed applications of these methods to reservoir simulations, as well as to simulations of filtration, insulating materials, and turbulence

PARTICIPANTS

Arbogast, Todd (Austin), Brandt, Achi (Rehovot), Clees, Tanja (Sankt Augustin), Diskin, Boris (Hampton), Dmitriev, Vitaly (Kaiserslautern), Efendiev, Yalchin (College Station), Grillo, Alfio (Frankfurt am Main), Iliev, Oleg (Kaiserslautern), Jenny, Patrick (Zürich), Klitz, Margrit (Bonn), Popov, Peter A. (College Station), Scheichl, Robert (Bath), Vassilevski, Panayot S. (Livermore), Willems, Jörg (College Station), Wu, Xiao-Hui (Houston), Zikatanov, Ludmil (Linz)

MINIWORKSHOP 0910b

01.03. - 07.03.2010 **The Pisot Conjecture - From Substitution Dynamical Systems to Rauzy Fractals and Meyer Sets**

Organisers: Valerie Berthe, Montpellier
David Damanik, Houston
Daniel Lenz, Chemnitz

ABSTRACT

A substitution is a non-erasing morphism of the free monoid. Subshifts generated by fixed points of substitutions are natural symbolic models for deterministic self-similar dynamical systems. The Pisot conjecture relates number theoretic properties of the substitution matrix to dynamical properties of the generated subshift. Explicitly, it states that the symbolic dynamical system of a unimodular Pisot substitution has pure point spectrum. This conjecture has attracted a fair amount of attention. In fact, Pisot substitutions systems and the Pisot conjecture have numerous applications, for example to Diophantine approximation, equidistribution properties of toral translations and low discrepancy sequences, beta-shifts, multidimensional continued fraction expansions, generation or recognition of arithmetic discrete planes, or else effective construction of Markov partitions for toral automorphisms, the main eigenvalue of which is a Pisot number. This mini-workshop brought together researchers with diverse backgrounds and a common interest in facets of the Pisot conjecture.

PARTICIPANTS

Arnoux, Pierre (Marseille), Baake, Michael (Bielefeld), Berthe, Valerie (Montpellier), Boshernitzan, Michael (Houston), Damanik, David (Houston), Ei, Hiromi (Tokyo), Frank, Natalie (Poughkeepsie), Frettlöh, Dirk (Bielefeld), Gähler, Franz (Bielefeld), Harriss, Edmund (London), Ito, Shunji (Kanazawa), Lee, Jeong-Yup (Seoul), Lenz, Daniel (Jena), Sing, Bernd (Bath), Thuswaldner, Jörg M. (Leoben)

MINIWORKSHOP 0910c

01.03. - 07.03.2009 **Non-Negativity is a Quantum Phenomenon**

Organisers: Stephane Launois, Kent
Tom Lenagan, Edinburgh

ABSTRACT

In recent publications, the same combinatorial description has arisen for three separate objects of interest: non-negative cells in the real grassmannian (Postnikov, Williams); torus orbits of symplectic leaves in the classical grassmannian (Brown, Goodearl and Yakimov); and, torus invariant prime ideals in the quantum grassmannian (Launois, Lenagan and Rigal). The aim of this meeting was to explore the reasons for this coincidence in matrices and the grassmannian in particular, and to explore similar ideas in more general settings

PARTICIPANTS

Baur, Karin (Zürich), Brenti, Francesco (Roma), Brown, Ken A. (Glasgow), Cauchon, Gerard (Reims), Goodearl, Kenneth R. (Santa Barbara), Lam, Thomas (Ann Arbor), Launois, Stephane (Canterbury), Leclerc, Bernard (Caen), Lenagan, Thomas H. (Edinburgh), Marsh, Robert J. (Leeds), Meriaux, Antoine (Reims), Rietsch, Konstanze (London), Rigal, Laurent (Villetaneuse), Williams, Lauren K. (Cambridge), Yakimov, Milen (Santa Barbara)

MINIWORKSHOP 0946a

08.11. - 14.11.2009 **Spectrum of Transfer Operators: Recent Developments and Applications**

Organisers: Viviane Baladi, Paris
Gerhard Keller, Erlangen
Carlangelo Liverani, Roma

ABSTRACT

Transfer operators are linear operators associated to discrete- or continuous-time dynamical systems with some hyperbolicity. Acting on suitable Banach spaces, they often have Perron-Frobenius type spectrum, although it can be quite tricky to find a proper Banach space on which this can be proved and be exploited to obtain statistical information about the dynamical system (SRB measures and other Gibbs states, exponential decay of correlations, statistical stability, probabilistic limit theorems, linear response, . . .). Transfer operators and their spectral theory provide a unifying framework for studying stochastic properties of chaotic deterministic dynamical systems. The goal of this workshop was to widen the class of systems that can be analysed in this way and to discuss and present new applications.

PARTICIPANTS

Baladi, Viviane (Paris), Balint, Peter (Budapest), Buzzi, Jerome (Orsay), Galatolo, Stefano (Pisa), Giulietti, Paolo (Roma), Gouezel, Sebastien (Rennes), Keller, Gerhard (Erlangen), Kesseböhmer, Marc (Bremen), Liverani, Carlangelo (Roma), Naud, Frederic (Avignon), Nonnenmacher, Stephane (Gif-sur-Yvette), Rugh, Hans-Henrik (Cergy-Pontoise), Smania, Daniel (Sao Carlos), Thomine, Damien (Paris), Toth, Imre Peter (Budapest), Tsujii, Masato (Fukuoka)

08.11. - 14.11.2009

Formal Methods in Commutative Algebra: A View Toward Constructive Homological Algebra

Organisers: Thierry Coquand, Göteborg
Alban Quadrat, Sophia Antipolis
Ihsen Yengui, Sfax

ABSTRACT

The purpose of the mini-workshop is to bring into the same place different mathematical communities that study constructive homological algebra and are motivated by different applications (e.g., constructive algebra, symbolic computation, proof theory, algebraic topology, mathematical systems theory, D-modules, dynamical systems theory) so that they can share their results, techniques, softwares and experiences. Through the development of a unified terminology, common mathematical problems, which naturally appear when making homological algebra constructive, were discussed.

PARTICIPANTS

Barakat, Mohamed (Saarbrücken), Cluzeau, Thomas (Limoges), Coquand, Thierry (Göteborg), Levandovskyy, Viktor (Aachen), Lombardi, Henri (Besancon), Perdry, Herve (Montrouge), Quadrat, Alban (Sophia Antipolis), Quitte, Claude (Chasseneuil), Robertz, Daniel (Aachen), Rubio, Julio (Logrono, La Rioja), Schuster, Peter (Leeds), Sergeraert, Francis (Saint-Martin-d'Heres), Spiwack, Arnaud (Palaiseau), Yengui, Ihsen (Sfax)

MINIWORKSHOP 0946c

08.11. - 14.11.2009 **Feinstrukturtheorie und Innere Modelle**

Organisers: Ronald Jensen, Berlin
Menachem Magidor, Jerusalem
Ralf Schindler, Münster

ABSTRACT

This workshop presented recent advances in fine structure and inner model theory. There were extended tutorials on hod mice and the Mouse Set Conjecture, suitable extender sequences and their fine structure, and the construction of true K below a Woodin cardinal in ZFC. The remaining talks involved precipitous ideals, stationary set reflection, failure of SCH in ZF, nonthreadable square sequences, reverse mathematics, forcing axioms, covering properties of canonical inner models, and "set theoretic geology."

PARTICIPANTS

Cox, Sean D. (Irvine), Feng, Qi (Singapore), Fuchs, Gunter (Staten Island), Gitik, Moti (Ramat Aviv, Tel Aviv), Jensen, Ronald Björn (Berlin), Koepke, Peter (Bonn), Magidor, Menachem (Jerusalem), Mitchell, William J. (Gainesville), Neeman, Itay (Los Angeles), Sargsyan, Grigor (Los Angeles), Schimmerling, Ernest (Pittsburgh), Schindler, Ralf-Dieter (Münster), Steel, John R. (Berkeley), Woodin, W. Hugh (Berkeley), Zeman, Martin (Irvine)

MINIWORKSHOP 0950a

06.12. - 12.12.2009 **The Escaping Set in Transcendental Dynamics**

Organisers: Walter Bergweiler, Kiel
Gwyneth Stallard, Milton Keynes

ABSTRACT

The escaping set of a transcendental entire or meromorphic function consists of all points which tend to infinity under iteration. Its importance in transcendental dynamics has increased significantly in recent years. The workshop focussed on a study of this set. The topics considered include the geometry of the escaping set, its Hausdorff dimension, its relation to the Julia set, and various subsets of the escaping set defined in terms of escape rates.

PARTICIPANTS

Badenska, Agnieszka (Warszawa), Baranski, Krzysztof (Warszawa), Bergweiler, Walter (Kiel), Eremenko, Alex E. (West Lafayette), Jarque, Xavier (Barcelona), Karpinska, Boguslawa (Warsaw), Mihaljevic-Brandt, Helena (Kiel), Nicks, Dan (Nottingham), Peter, Joern (Kiel), Rempe, Lasse (Liverpool), Rippon, Philip J. (Milton Keynes), Schleicher, Dierk (Bremen), Stallard, Gwyneth M. (Milton Keynes), Taixes, Jordi (Barcelona), Urbanski, Mariusz (Denton), Zdunik, Anna (Warszawa)

06.12. - 12.12.2009 **Modeling and Understanding Random Hamiltonians: Beyond Monotonicity, Linearity and Independence**

Organisers: Günter Stolz, Birmingham
van Veselic, Chemnitz

ABSTRACT

The mini-workshop was devoted to the spectral analysis of random Schrödinger-type operators. While this topic has been intensively studied by physicists and mathematicians for several decades, more recently there has been particular attention devoted to models where the random parameters enter the model in a non-monotone or non-linear way. Most of the established methods applied for random operators, in fact, hinge on the presence of monotonicity w. r. t. randomness. Thus the treatment of non-monotone models forces a deeper analysis of the structure of random Hamiltonians and, in particular, the interplay of the kinetic and the potential energy parts.

PARTICIPANTS

Borisov, Denis (Ufa), Boumaza, Hakim (Villetaneuse), Damanik, David (Houston), Elgart, Alexander (Blacksburg), Germinet, Francois (Cergy-Pontoise), Graf, Gian Michele (Zürich), Kirsch, Werner (Hagen), König, Wolfgang D. (Berlin), Kostrykin, Vadim (Mainz), Lenz, Daniel (Jena), Nakamura, Shu (Tokyo), Nichols, Roger (Birmingham), Schulz-Baldes, Hermann (Erlangen), Stolz, Günter (Birmingham), Tautenhahn, Martin (Chemnitz), Veselic, Ivan (Chemnitz)

MINIWORKSHOP 0950c

06.12. - 12.12.2009 **Geometry of Quantum Entanglement**

Organisers: Andreas Buchleitner, Freiburg
Stanislaw Szarek, Paris and Cleveland
Elisabeth Werner, Cleveland and Lille
Karol Zyczkowski, Krakow

ABSTRACT

The workshop aimed at developing interactions between researchers from quantum information theory and from asymptotic geometric analysis. A central notion discussed was the phenomenon of quantum entanglement, which naturally leads to geometric considerations in high-dimensional vector spaces. In these spaces, phenomena such as concentration of measure become prominent and may invalidate our low-dimensional intuition.

PARTICIPANTS

Aubrun, Guillaume (Villeurbanne), Bengtsson, Ingemar (Stockholm), Buchleitner, Andreas (Freiburg), Datta, Nilanjana (Cambridge), Horodecki, Michal (Gdansk), Jenkinson, Justin (Cleveland), Kus, Marek (Warszawa), Marciniak, Marcin (Gdansk), Ruskai, Mary Beth (Arlington), Sauer, Simeon (Freiburg), Skowronek, Lukasz (Krakow), Sommers, Hans-Jürgen (Duisburg), Szarek, Stanislaw Jerzy (Paris), Tichy, Malte (Freiburg), Tiersch, Markus (Innsbruck), Werner, Elisabeth (Cleveland), Zyczkowski, Karol (Krakow)

2.5. Arbeitsgemeinschaften

ARBEITSGEMEINSCHAFT 0914

29.03. - 04.04.2009 **Optimal Transport and Geometry**

Organisers: Felix Otto, Bonn
Karl-Theodor Sturm, Bonn

ABSTRACT

This Arbeitsgemeinschaft was devoted to recent developments in optimal transport with emphasis on links and applications to geometry. The topics reached from the origin of optimal transport as a variational problem, where one minimizes a transportation cost when transporting one density into another, over the introduction of a metric on the space of probability measures, leading to the Wasserstein-space and convex funtionals on it, to the connection between Ricci-curvature and the optimal mass transport problem.

PARTICIPANTS

Bertrand, Jerome (Toulouse), Bunke, Ulrich (Regensburg), Cotar, Codina (Garching), Deninger, Christopher (Münster), Erbar, Matthias (Paris), Franek, Marzena (Münster), Gigli, Nicola (Talence), Glöckner, Helge (Paderborn), Goldman, Dorian Anthony (Bonn), Hader, Bernhard (Bonn), Hinz, Michael (Jena), Hongler, Clement (Geneve), Huang, Xueping (Bielefeld), Huesmann, Martin (Bonn), Kirchheim, Bernd (Düsseldorf), Kuwada, Kazumasa (Bonn), Latuszynski, Krzysztof (Coventry), Lehec, Joseph (Marne-La-Vallee), Lim, Adrian (Luxembourg), Liu, Shiping (Leipzig), Luo, Dejun (Luxembourg), Maas, Jan (Delft), Menz, Georg (Bonn), Ohta, Shin-ichi (Kyoto), Otto, Felix (Bonn), Philipowski, Robert (Bonn), Schnürer, Oliver C. (Berlin), Sei, Tomonari (Tokyo), Seis, Christian (Bonn), Selinger, Christian (Luxembourg), Simon, Miles (Freiburg), Spadaro, Emanuele Nunzio (Zürich), Sturm, Karl-Theodor (Bonn), Viehmann, Thomas (Bonn), Walter, Boris (Paderborn)

04.10. - 09.10.2009 **Minimal Surfaces**

Organisers: William H. Meeks, Amherst
Matthias Weber, Bloomington

ABSTRACT

The theory of Minimal Surfaces has developed rapidly in the past 10 years. There are many factors that have contributed to this development: - Sophisticated construction methods have been developed and have supplied us with a wealth of examples which have provided intuition and spawned conjectures. - Deep curvature estimates by Colding and Minicozzi give control on the local and global behavior of minimal surfaces in an unprecedented way. - Much progress has been made in classifying minimal surfaces of finite topology or low genus in R^3 or in other flat 3-manifolds. For instance, all properly embedded minimal surfaces of genus 0 in R^3, even those with an infinite number of ends, are now known. - There are still numerous difficult but easy to state open conjectures, like the genus-g helicoid conjecture: There exists a unique complete embedded minimal surface with one end and genus g for each g, or the related Hoffman-Meeks conjecture: A finite topology surface with genus g and n>=2 ends embeds minimally in R^3 with a complete metric if and only if n<=g+2. - Sophisticated tools from 3-manifold theory have been applied and generalized to understand the geometric and topological properties of properly embedded minimal surfaces in R^3. - Minimal surfaces have had important applications in topology and play a prominent role in the larger context of geometric analysis.

PARTICIPANTS

Abresch, Uwe (Bochum), Bernstein, Jacob (Stanford), Breiner, Christine (Cambridge), Calle, Maria (Madrid), Cartier, Sebastien (Marne la Vallee), Choe, Jaigyoung (Seoul), Choi, Hagyun (Seoul), Clarke, Andrew (Nantes), Coutant, Antoine (Creteil), Douglas, Casey (Saint Mary's City), Faltings, Gerd (Bonn), Fröhlich, Steffen (Berlin), Grosse, Nadine (Regensburg), Grosse-Brauckmann, Karsten (Darmstadt), Hoffman, David (Stanford), Kuessner, Thilo (Münster), Kusner, Robert B. (Amherst), Lee, Hojoo (Seoul), Manzano, Jose Miguel (Granada), Martin, Francisco (Granada), Meeks, William H. (Amherst), Min, Sunghong (Seoul), Neel, Robert (Bethlehem), Nguyen, Tuan Khanh Hoan (Münster), Park, Sung-ho (Seoul), Perez, Joaquin (Granada), Plehnert, Julia (Darmstadt), Pyo, Juncheol (Seoul), Rodriguez-Perez, Magdalena (Madrid), Seo, Keomkyo (Seoul), Smith, Graham A.C. (Bellaterra), Spadaro, Emanuele Nunzio (Zürich), Sullivan, John M. (Berlin), Tinaglia, Giuseppe (Coventry),

2.6. Oberwolfach Seminare

OBERWOLFACH SEMINAR 0923a

31.05. - 06.06.2009 **Bounded Cohomology**

Organisers: Michelle Bucher-Karlsson, Stockholm
Nicolas Monod, Lausanne
Pierre Py, Chicago

ABSTRACT

Bounded cohomology of groups and spaces has found many applications in diverse areas, including geometry, topology, representation theory, dynamics, rigidity, ergodic theory, symplectic geometry. The theory itself may feel, at first, a bit exotic as it blends ideas as seemingly different as ergodic theory and homological algebra. The goal of this seminar is to show that in fact bounded cohomology is "user-friendly". The participants will be shown concrete applications, but will also be introduced to the many still mysterious aspects of the theory that need to be explored. The seminar will introductory, with an emphasis on applications and starting from scratch.

PARTICIPANTS

Brandenbursky, Michael (Haifa), Bucher-Karlsson, Michelle (Stockholm), Buehler, Theo (Zürich), Demir, Ali Sait (Maslak Istanbul), Frankel, Steven (Pasadena), Frigerio, Roberto (Pisa), Gelander, Tsachik (Jerusalem), Gendulphe, Matthieu (Fribourg), Glasner, Yair (Beer Sheva), Gongopadhyay, Krishnendu (Mumbai), Grabowski, Lukasz (Göttingen), Hartnick, Tobias (Zürich), Hohloch, Sonja (Berkeley), Huber, Thomas (Zürich), Lecureux, Jean (Villeurbanne), Louwsma, Joel (Pasadena), Merigon, Stephane (Darmstadt), Militon, Emmanuel (Orsay), Monod, Nicolas (Lausanne), Pagliantini, Cristina (Pisa), Picaud, Jean-Claude (Tours), Py, Pierre (Chicago), Schlicht, Peter (Göttingen), Seppänen, Henrik (Darmstadt), Strubel, Tobias (Zürich)

31.05. - 06.06.2009

Equidistribution of Finite Volume Orbits on Homogeneous Spaces

Organisers: Manfred Einsiedler, Columbus
Philippe Michel, Lausanne
Elon Lindenstrauss, Jerusalem/Princeton

ABSTRACT

The seminar consists of the following 3 courses: a) Noncompact Semisimple groups. This course includes a discussion of the theory of unipotent dynamics, a proof of a special case of Ratner's measure classification (which is the first step towards the equidistribution and orbit closure theorems) and the corresponding special case of the result due to Mozes and Shah. Finally the theorems will be applied to an equidistribution result for integer points on big spheres and ellipsoids. b) Diagonalizable subgroups. This course includes the definition and basic properties of measure-theoretic and topological entropy, statement of a partial measure classification theorem, and some number theoretic applications, e.g. to distribution of ideal classes. c) Dynamical properties of number field lattices. This lecture, which may be seen as a supplement to b), will focus on arithmetic aspects of the theory. This will be the occasion to discuss different (sometimes complementary) approaches and to introduce other tools such as L-functions, automorphic forms and (possibly) the language of adeles.

PARTICIPANTS

Diehl, Christina (Zürich), Einsiedler, Manfred (Columbus), Ernvall-Hytönen, Anne-Maria (Stockholm), Grobner, Harald (Wien), Haynes, Alan K. (Heslington, York), Lindenstrauss, Elon (Princeton), Louvel, Benoit (Lausanne), Lytle, Beverly (Columbus), Menares, Ricardo (Lausanne), Michel, Philippe (Lausanne), Moldovan, Daniel Arnold (Lausanne), van Order, Jeanine (Cambridge), Pohl, Anke (Paderborn), Rosenzweig, Lior (Tel Aviv), Saxce, Nicolas (Orsay), Shapira, Uri (Jerusalem), Strasser, Gabriel (Wien), Tseng, Jimmy (Columbus), Ueberschär, Henrik (Bristol), Varju, Peter (Princeton), Vukadin, Ognjen (Wien), Woodbury, Michael C. (Madison), Wu, Han (Orsay), Zamojski, Tomasz (Chicago)

18.10. - 24.10.2009

The Erlangen Program, Myths and Realities: Geometry and Group Theory, 1870-1920

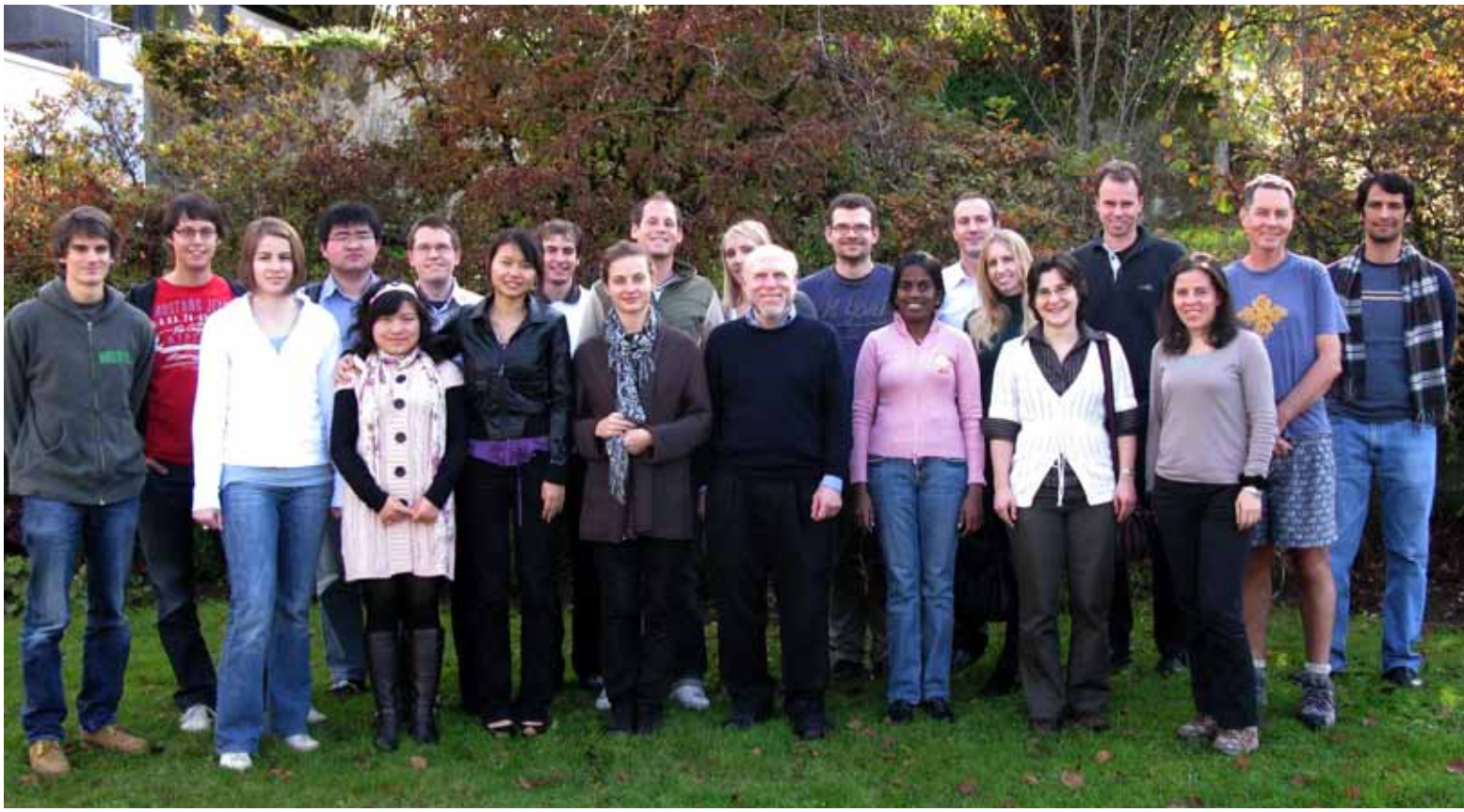
Organisers: Igor Dolgachev, Ann Arbor
David Rowe, Mainz
Klaus Volkert, Köln
Duco van Straten, Mainz

ABSTRACT

This is an interdisciplinary seminar that focuses on an important topic in the history of mathematics. As every geometer knows, Felix Klein's "Erlangen Program" ("Vergleichende Betrachtungen über neuere geometrische Forschungen") argued that group theory provided an ideal framework for unifying geometrical research. In Klein's time geometers did not sharply distinguish between algebraic and differential geometry, nor did they tend to emphasize whether they were working over the real or complex numbers. Classical geometers often used imaginary coordinates to describe various phenomena, but distinguished these from real solutions. Within this rather chaotic setting, the 23-year-old Klein came up with the idea that the various approaches to geometry could be understood as the invariant theories associated with the various kinds of transformation groups that act on a given manifold. In this seminar we will reassess the historical significance of Klein's "Erlangen Program" by exploring three different phases in which geometry was enriched by the theory of groups.

PARTICIPANTS

Chang, Fu-Kai (Mainz), Charlet, Christoph (Mainz), Cogliati, Alberto (Milano), Davison, Brenda (Burnaby, B.C.), Dolgachev, Igor (Ann Arbor), Fresan Leal, Javier (Villetaneuse), Gerbracht, Eberhard H. A. (Gifhorn), Giovannini, Eduardo Nicolas (Paderborn), Labs, Oliver (Saarbrücken), Lehn, Manfred (Mainz), Meynert, Hans-Christian (Wuppertal), Moussard, Guillaume (Nantes), Ramirez Ogando, G. Alfredo (Wuppertal), Rodriguez, Laura (Leipzig), Romera-Lebret, Pauline (Nantes), Rowe, David E. (Mainz), Sallent Del Colombo, Emma (Barcelona), Schneider, Martina (Leipzig), van Straten, Duco (Mainz), Volkert, Klaus (Wuppertal), Wahl, Charlotte (Hannover), Wildberger, Norman J. (Sydney), Zappulla, Carmela (Palermo)



18.10. - 24.10.2009 **Semiparametric and Nonparametric Regression**

Organisers: Raymond Carroll, College Station
Ciprian Crainiceanu, Baltimore
Matthew Wand, Wollongong

ABSTRACT

Semiparametric regression is concerned with the flexible nearly nonparametric incorporation of nonlinear functional relationships in regression analyses. Assuming only a basic familiarity with ordinary regression, this short-course explains the techniques and benefits of semiparametric regression in a concise and modular fashion. Spline functions, linear mixed models and Bayesian hierarchical models are shown to play an important role in semiparametric regression. There will be a strong emphasis on implementation in R and BUGS.

PARTICIPANTS

Birke, Melanie (Bochum), Carroll, Raymond J. (College Station), Castro-Sanchez, Amparo Yovanna (Diepenbeek), Crainiceanu, Ciprian (Baltimore, MD), Fenske, Nora (München), Grith, Maria (Berlin), Groll, Andreas (München), Guo, Mengmeng (Berlin), Heinzl, Felix (München), Hofner, Benjamin (Erlangen), Lamby, Philipp (Columbia), Martinez, Josue G. (College Station), Rubenbauer, Stephanie (München), Slaets, Leen (Leuven), Sobotka, Fabian (Oldenburg), Song, Richard Song (Berlin), Tharmaratnam, Kukatharmini (Leuven), Umlauf, Nikolaus (Innsbruck), Wand, Matthew (Wollongong), Wang, Weining (Berlin), Wechselberger, Peter (Innsbruck)

22.11. - 28.11.2009 **New Trends in Algorithms for Real Algebraic Geometry**

Organisers: Saugata Basu, Atlanta
Monique Laurent, Amsterdam
Marie-Francoise Roy, Rennes
Frank Sottile, College Station

ABSTRACT

Algorithms in real algebraic geomety enjoy currently a quick development in various directions. The aim of the seminar is to introduce the participants to a variety of newly developed methods for algorithms in real algebraic geometry, linking the topic to several other fields of pure and applied mathematics. The lecturers will base their talks on available documents: survey papers, recent publications and will make every effort to be accessible to non specialists.

PARTICIPANTS

Barone, Salvador P. (West Lafayette), Basu, Saugata (West Lafayette), Bembe, Daniel (München), Biagioli, Eric Javier (Le Chesnay), de Wolff, Timo (Frankfurt), Fletcher, Matthew (Coventry), Gravin, Nikolay (St. Petersburg), Hauenstein, Jonathan (Notre Dame), Laurent, Monique (Amsterdam), Martin del Campo, Abraham (College Station), Moussa, Seydou (Niamey), Nguyen, Hong Duc (Kaiserslautern), Omar, Mohamed (Davis), Otto, Adamou (Niamey), Perrucci, Daniel (Buenos Aires), Phan Thanh, Tung (Toulouse), Regts, Guus (Amsterdam), Riener, Cordian (Frankfurt am Main), Roy, Marie-Francoise (Rennes), Sanyal, Raman (Berkeley), Scheiblechner, Peter (West Lafayette), Sottile, Frank (College Station), Varvitsiotis, Antonios E. (Amsterdam), Vinzant, Cynthia (Berkeley), Yu, Josephine T. (Berkeley)

22.11. - 28.11.2009 **Computational Fluid Dynamics**

Organisers: Michael Dumbser, Trento
Christiane Helzel, Bochum
Michael Junk, Konstanz
Claus-Dieter Munz, Stuttgart

ABSTRACT

The seminar gives an introduction to Computational Fluid Mechanics and deals mainly with numerical techniques for solving the compressible Navier-Stokes equations. We will try to give an overview of the commonly used methods and the candidates for the next generation of CFD codes. The specific topics are: 1) Finite volume schemes and their basic building blocks, 2) High order accuracy in space and time, 3) Cartesian grid methods and AMR (Automatic Mesh Refinement), 4) Basic building blocks of discontinuous Galerkin schemes, 5) Lattice Boltzmann methods for incompressible flow, 6) The Low Mach number problem. We address the advantages and disadvantages of the different approaches to solve numerically the practical problems of aerodynamics, aeroacoustics, and fluid mechanics. The seminar will be devised for an interdisciplinary audience from mathematics, engineering and natural sciences. Some background in the numerical solution of differential equations, about conservation equations and the equations of fluid motion are required. Manuscripts on the different topics will be made available.

PARTICIPANTS

Bauer, Olav (Stuttgart), Bennison, Thomas (Nottingham), Boger, Markus A. (Stuttgart), Bollermann, Andreas (Aachen), Budday, Johannes (Konstanz), Contu, Pietro (Cagliari), Dumbser, Michael (Trento), Frings, Thies (Aachen), Hantke, Maren (Magdeburg), Helzel, Christiane (Bochum), Junk, Michael (Konstanz), Kissling, Frederike (Stuttgart), Lass, Oliver (Konstanz), Milgrom, Timur (Philadelphia), Müller, Andreas (Mainz), Munz, Claus-Dieter (Stuttgart), Nunez, Jonatan A. (Stuttgart), Peterseim, Daniel (Berlin), Prignitz, Rodolphe (Erlangen), Rupp, Karl (Wien), Schmeyer, Ellen (Berlin), Shin, Seoleun (Potsdam), Taetz, Bertram (Bochum), Waidmann, Matthias (Berlin), Yang, Zhaoxia (Konstanz)

2.7. Fortbildungsveranstaltung / Training week

TRAININGS- UND ABSCHLUß-SEMINAR FÜR DIE INTERNATIONALE MATHEMATIK-OLYMPIADE 0921

16.05.-23.05.2009 **Trainings- und Abschluß-Seminar für die Internationale Mathematik-Olympiade**

Organiser: Hans-Dietrich Gronau, Rostock

ABSTRACT

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

PARTICIPANTS

Arnold, Bertram (Halle), Cremer, Pascal (Korschenbroich), Görlach, Paul (Schleusingen), Harbecke, David (Bonn), Höer, Tobias, (Weifa), Hutschenreiter, Lisa (Ottendorf-Okrilla), Janda, Felix (Höhenkirchen), Krause, Achim (Horb a.N.), Krebs, Martin, (Rottershausen), Kröner, Christoph (Rosstal), Lackmann, Malte (Bordesholm), Martin, Jean-François (Le Sappey en Chartreuse), Merker, Martin (Kahla), Phan, Phi-Lon (München), Reinhold, Jens (Bielefeld), Sauermann, Lisa (Dresden), Schweiger, Florian (Marktoberdorf)

FORTBILDUNGSVERANSTALTUNG FÜR BIBLIOTHEKSLEITER 0944b

25.10. - 31.10.2009 **Fortbildungsveranstaltung für Bibliotheksleiter**
Organiser: Petra Hätscher, Konstanz

ABSTRACT

This was the training week for library administrators and directors of the State of Baden-Württemberg which takes place on a two-year-rotation with a training week for math teachers in secondary schools. The topic was "eRessourcen – Chancen, Probleme, Lösungen".

PARTICIPANTS

Becht, Michael (Freiburg), Dannehl, Wiebke (Stuttgart), Dressler, Juliane (Heidelberg), Gaier, Dorothea (Stuttgart), Haag, Jan (Ulm), Hänger, Christian (Mannheim), Hätscher, Petra (Konstanz), Hauck, Bernhard (Freiburg), Hillmann, Silke (Stuttgart), Hölzer, Cornelia (Stuttgart), Katz, Cornelia (Konstanz), Kirchgäßner, Adalbert (Konstanz), Klein, Annette (Mannheim), Knödler-Kagoshima, Brigitte (Karlsruhe), Leibing, Isabell (Konstanz), Magee, Kirsten (Tübingen), Mileck, Nicolai (Heidelberg), Mundt, Sebastian (Stuttgart), Puskas, Sabine (Tübingen), Rautenberg, Anke (Konstanz), Schmid, Susanne (Tübingen)

2.8. Research in Pairs

Die folgenden Forscher nahmen 2009 am Research in Pairs Programm teil.

HENN, Hans Werner / Straßburg LANNES, Jean / Palaiseau	11.01.-24.01.2009
BARGE, Marcy / Bozeman BRUIN, Henk / Guildford STIMAC, Sonja / Zagreb	11.01.-24.01.2009
PANINA, Gaiane / St. Petersburg STREINU, Ileana / Northampton	18.01.-31.01.2009
KURKE, Herbert / Berlin OSIPOV, Denis / Moskau ZHEGLOV, Alexander / Moskau	25.01.-07.02.2009
MATESSI, Carlo / Pavia SCHNEIDER, Kristian / Wien	01.02.-21.02.2009
HUMILIERE, Vincent / München ROY, Nicolas / Berlin	01.02.-14.02.2009
HAPPEL, Dieter / Chemnitz ZACHARIA, Dan / Syracuse	15.02.-28.02.2009
KUTEV, Nickolai / Sofia KAWOHL, Bernd / Köln	22.02.-07.03.2009
HINTERMÜLLER, Michael / Berlin HINZE, Michael / Hamburg HOPPE, Ronald / Augsburg	01.03.-15.03.2009
BODNARCHUK, Lesya / Bures-sur-Yvette BURBAN, Igor / Bonn DROZD, Yuri / Kiew	08.03.-21.03.2009
CAPARCE, Pierre-Emmanuel / Paris GRAMLICH, Ralf / Darmstadt MÜHLHERR, Bernhard / Brüssel	15.03.-28.03.2009
BONAMI, Aline / Orleans POTT, Sandra / Magdeburg SEHBA, Florent / Glasgow WICK, Brett / Atlanta	22.03.-04.04.2009
OLEVSKI, Alexander / Tel Aviv ULANOVSKII, Alexander / Stavanger	05.04.-25.04.2009
MORIER-GENOUD, Sophie / Paris OVSIENKO, Valentin / Lyon	05.04.-18.04.2009
ALTINEL, Tuna / Lyon WILSON, John S. / Oxford	12.04.-25.04.2009
DIEKMANN, Odo / Utrecht GYLLENBERG, Mats / Helsinki METZ, Johann / Leiden	19.04.-03.05.2009
DRAGNEV, Peter / Fortwayne ZORII, Natalia / Kiew SAFF, Edward / Nashville	03.05.-16.05.2009
SCHÜRMANN, Achill / Delft SIKIRIC-DUTOUR, Mathieu / Zagreb VALLENTIN, Frank / Amsterdam	03.05.-16.05.2009
TRACY, Craig / Davis WIDOM, Harold / Santa Cruz	17.05.-30.05.2009
PARKER, Christopher / Birmingham ROWLEY, Peter / Manchester	17.05.-30.05.2009

The following researchers attended the Research in Pairs Programme in 2009.

KAUFFMANN, Louis / Chicago MANTUROV, Vassiliy	31.05.-13.06.2009
BAIER, Stephan / Bremen ZHAO, Liangyi / Singapore	07.06.-20.06.2009
FINASHIN, Sergey / Ankara KHARLAMOV, Vyatcheslac / Straßburg	07.06.-27.06.2009
ANDERSON, James / Lonndon HINKKANEN, Aimo 7 Urbana	14.06.-04.07.2009
IZHAKIAN, Zur / Tel Aviv KNEBUSCH, Manfred / Regensburg ROWEN, Louis / Tel Aviv	05.07.-19.07.2009
ITENBERG, Ilia / Straßburg SHUSTIN, Eugenii / Tel Aviv	05.07.-19.07.2009
ALEXANDER, Stephanie / Urbana PETRUNIN, Anton / Park University	12.07.-25.07.2009
BRADEN, Tom / Aimhurst LICATA, Anthony / Stanford PROUDFOOT, Nicholas / Eugene WEBSTER, Ben / Princeton	19.07.-01.08.2009
BUX, Kai-Uwe / Charlottesville GRAMLICH, Ralf / Darmstadt	26.07.-08.08.2009
JEFFRES, Thalia / Wichita ROWLETT, Julie / Santa barbara	26.07.-15.08.2009
BENES, Christian / Brooklyn JOHANSSON, Frederik / Stockholm KOZDRON, Michael / Regina	02.08.-15.08.2009
BAUR, Karin / Zürich HILLE, Lutz / Münster	16.08.-29.08.2009
BUCHWEITZ, Ragnar-Olaf / Toronto FLENNER, Hubert / Bochum	16.08.-29.08.2009
DI FRANCESCO, Philippe / Paris KEDEM, Rinat 7 Urbana	16.08.-05.09.2009
SKOWRONSKI, Andrzej / Torun YAMAGATA, Kunio / Tokio	30.08.-12.09.2009
BRINGMANN, Kathrin / Köln MAHLBURG, Karl / Cambridge	06.09.-26.09.2009
BERGER, Tobias / Cambridge KLOSIN, Krzysztof / Ithaca	13.09.-26.09.2009
MORMUL, Piotr / Warschau ZHITOMIRSKII, Michail / Haifa	20.09.-03.10.2009
ROYSTON, Patrick / London SAUERBREI, Wilhelm / Freiburg	27.09.-10.10.2009
GORBACHEV, Dmitriy / Tula LIFLYAND, Elijah / Ramat-Gan TIKHONOV/ Sergey , Barcelona	11.10.-24.10.2009
BLAGOJEVIC, Pavle / Beograd McCLEARY, John / Cambridge	10.10.-24.10.2009

KUSHNER, Alexey / Astrakhan LYCHAGIN, Valentin / Tromso RUBTSOV, Vladimir / Angers	25.10.-07.11.2009
BLOK, Rieuwert / Bowling Green HOFFMANN, Corneliu / Birmingham	09.11.-22.11.2009
ARSLANOV, Marat / Kazan OMANADZE, Roland / Tbilisi	08.11.-28.11.2009
BARSEGIAN, Grigor / Yerevan BEGEHR, Heinrich / Berlin KHIMSHIASHVILI, Giorgie / Triest	08.11.-28.11.2009
CHECHKIN, Gregory A. / Moskau MELNYK, Taras / Kiew	08.11.-21.11.2009
HANAKI, Akihide / Matsumoto ZIESCHANG, Paul-Hermann / Broensville	29.11.-19.12.2009
FRAENKEL, L. Edward / Toronto McLEOD, John Bryce / Oxford	29.11.-19.12.2009
PARKER, Christopher / Birmingham STROTH, Gernot / Halle	29.11.-12.12.2009

Louis H. Kaufman, Vassily O. Manturov

Julie Rowlett, Thalia D. Jeffres

2.9. Oberwolfach Leibniz Fellows

Anfang 2007 wurde am Mathematischen Forschungsinstitut Oberwolfach (MFO) ein neues Postdoktorandenprogramm eingeführt, das durch die Leibniz-Gemeinschaft gefördert wird. Ziel dieses Programms ist es, herausragende junge 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.

Beginning in 2007 the Mathematisches Forschungsinstitut Oberwolfach (MFO) has set up a new programme for postdoctoral researchers. This programme is supported by the Leibniz-Gemeinschaft. The focus of this programme 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.

LEUSTEAN, Laurentiu/Darmstadt	**5 weeks**	**08.01. - 13.02.2009**
external guest researchers:		
ESPINOLA, Rafael/Sevilla	1 week	18.01. - 24.01.2009
LOPEZ, Genaro/Sevilla	1 week	18.01. - 24.01.2009
PARK, Sejong/Aberdeen	**11 weeks**	**01.02. - 09.04.2009**
external guest researchers:		
STANCU, Radu/Amiens	1 week	29.03. - 04.04.2009
MAZZA, Nadia/Lancaster	1 week	29.03. - 04.04.2009
DIAZ, Antonio/Kobenhavn	1 week	29.03. - 04.04.2009
HERING, Milena/Tübingen	**8 weeks**	**08.06. - 25.07.2009**
without external researchers		
BERGER, Pierre/Paris	**5 weeks**	**01.07. - 31.07.2009**
without external researchers		
MANZYUK, Oleksandr/Kaiserslautern	**13 weeks**	**02.07. - 30.09.2009**
without external researchers		
KERNER, Dmitri/Tel Aviv	**8 weeks**	**01.08. - 28.08.2009** **20.09. - 17.10.2009**
without external researchers		
SALEPCI-FERRET, Nermin/Straßburg	**13 weeks**	**01.09. - 30.11.2009**
external guest researcher:		
ÖZTÜRK, Ferit/Istanbul	13 weeks	01.09. - 30.11.2009
BODNARCHUK, Lesya/Kaiserslautern	**4 weeks**	**06.09. - 02.10.2009**
external guest researcher:		
BURBAN, Igor/Bonn	1 week	06.09. - 12.09.2009
	1 week	27.09. - 02.10.2009
MÜLLNER, Daniel/Heidelberg	**9 weeks**	**01.10. - 30.11.2009**
without external researchers		
LEUSTEAN, Laurentiu/Darmstadt	**7 weeks**	**14.09. - 31.10.2009**
without external researchers		
ONARAN, Sinem Celik/Ankara	**13 weeks**	**01.10. - 31.12.2009**
without external researchers		

2.10. Publikationen 2009

Das MFO unterstützt die Idee von Open Access. Daher sind alle Publikationen auf der Webseite www.mfo.de des MFO 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 extended abstracts der Vorträge. In 2009 sind die Bände OWR 6.1 bis 6.4 mit mehr als 3000 Seiten erschienen.

Oberwolfach Seminars (OWS)
OWS ist eine Buchreihe in Zusammenarbeit mit dem Birkhäuser Verlag (Basel), die den Stoff der Oberwolfach Seminare für Doktoranden, Postdocs und interessierte Forscher zugänglich macht. In 2009 wurde ein Titel publiziert:

- Oberwolfach Seminars vol. 39 (2009), 171 Seiten
  Titel; Lectures on Algebraic Statistics
  Autoren: Drton, M, ; Sturmfels, B.; Sullivant, S.

Sonderpublikationen 2009

- Titel: MAGINARY Austellungskatalog
  Autoren: Gert-Martin Greuel, Andreas Daniel Matt
  (Broschüre, 125 Seiten)

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. In 2009 sind die folgenden Preprints erschienen:

2.10 Publications 2009

The MFO supports the idea of Open Access. Hence, all publications are freely available on the website www.mfo.de of the MFO (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 miniworkshops and Arbeitsgemeinschaften. In 2009, the issues OWR 6.1 to 6.4 were published with more than 3000 pages in total.

Oberwolfach Seminars (OWS)
In order to make the Oberwolfach Seminars available to an even larger audience, the MFO supports the publication within the book series OWS, published in cooperation with Birkhäuser (Basel). In 2009, one book was published:

Special Publications 2009

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 2009:

- OWP 2009 - 27
  Title: Optimal Bounds for the Colored Tverberg Problem
  Authors: Pavle V. M. Blagojevic, Benjamin Matschke and Günter M. Ziegler (RiP 2009)
- OWP 2009 - 26
  Title: Weighted Fourier Inequalities for Radial Functions
  Authors: D. Gorbachev, E. Liflyand and S. Tikhonov (RiP 2009)
- OWP 2009 - 25
  Title: A new Counting Function for the Zeros of Holomorphic Curves
  Authors: J. M. Anderson and Aimo Hinkkanen (RiP 2009)
- OWP 2009 - 24
  Title: Discrete Non-commutative Integrability: the Proof of a Conjecture by M. Kontsevich
  Authors: Philippe di Francesco and Rinat Kedem (RiP 2009)
- OWP 2009 - 23
  Title: On Siegel Modular Forms of Level p and their Properties mod p
  Authors: Siegfried Böcherer and Shoyu Nagaoka (RiP 2008)

- OWP 2009 - 22
  Title: On the Distribution of a Second Class Particle in Asymmetric Simple Exclusion Process
  Authors: Craig A. Tracy and Harold Widom (RiP 2009)
- OWP 2009 - 21
  Title: Positivity of the T-system Cluster Algebra
  Authors: Phillipe di Francesco and Rinat Kedem (RiP 2009)
- OWP 2009 - 20
  Title: Simple Vector Bundles on Plane Degenerations of an Elliptic Curve
  Authors: Lesya Bodnarchuk, Yuriy Drozd and Gert-Martin Greuel (RiP 2009)
- OWP 2009 - 19
  Title: Alternative Iterative Methods for Nonexpansive Mappings, Rates of Convergence and Applications
  Authors: Vittorio Colao, Laurentiu Leustean, Genaro López and Victoria Martín-Márquez (OWLF 2009)
- OWP 2009 - 18
  Title: The Contact Polytope of the Leech Lattice
  Authors: Mathieu Dutour Sikiric, Achill Schürmann, and Frank Vallentin (RiP 2009)
- OWP 2009 - 17
  Title: Approximation of Discrete Fuctions and Size of Spectrum
  Authors: Alexander Olevskii and Alexander Ulanovskii (RiP 2009)
- OWP 2009 - 16
  Title: Control of Volterra Systems with Scalar Kernels
  Authors: Bernhard H. Haak and Birgit Jacob (RiP 2008)
- OWP 2009 - 15
  Title: On the Geometry of the Space of Fibrations
  Authors: Vincent Humilière and Nicolas Roy (RiP 2009)
- OWP 2009 - 14
  Title: Tilting on Non-Commutative Rational Projective Curves
  Authors: Igor Burban and Yuriy Drozd (RiP 2009)
- OWP 2009 - 13
  Title: An Introduction to Heavy-tailed and Subexponential Distributions
  Authors: Sergey Foss, Dmitry Korshunov and Stan Zachary (RiP 2008)
- OWP 2009 - 12
  Title: Simple Graded Commutative Algebras
  Authors: Sophie Morier-Genoud and Valentin Ovsienko (RiP 2009)
- OWP 2009 - 11
  Title: Homological Properties of Piecewise Hereditary Algebras
  Authors: Dieter Happel and Dan Zacharia (RiP 2009)
- OWP 2009 - 10
  Title: A Study on Gradient Blow up for Viscosity Solutions of Fully Nonlinear, Uniformly Elliptic Equations
  Authors: Bernd Kawohl and Nikolai Kutev (RiP 2009)
- OWP 2009 - 09
  Title: Stein's Method for Dependent Random Variables Occurring in Statistical Mechanics
  Authors: Peter Eichelsbacher and Matthias Löwe (RiP 2008)
- OWP 2009 - 08
  Title: Classification of Idempotent States on the Compact Quantum Groups $U_q(2)$, $SU_q(2)$ and $SO_q(3)$
  Authors: Uwe Franz, Adam Skalski and Reiji Tomatsu (RiP 2008)
- OWP 2009 - 07
  Title: Singer Quadrangles
  Authors: S. de Winter, E. E. Shult and Koen Thas (RiP 2007)
- OWP 2009 - 06
  Title: Pointwise Hyperbolicity Implies Uniform Hyperbolicity
  Authors: Boris Hasselblatt, Yakov Pesin and Jörg Schmeling (RiP 2008)
- OWP 2009 - 05
  Title: Proof Mining in Metric Fixed Point Theory and Ergodic Theory
  Author: Laurentin Leustean (OWLF 2009)
- OWP 2009 - 04
  Title: Minimal Riesz Energy on the Sphere for Axis-supported External Fields
  Authors: J. S. Brauchart, P. D. Dragnev and E. B. Saff (OWLF 2008)
- OWP 2009 - 03
  Title: On the Non-analyticity Locus of an Arc-analytic Function
  Authors: Krzysztof Kurdyka and Adam Parusinski (RiP 2008)
- OWP 2009 - 02
  Title: Heisenberg-Weyl Algebra Revisited: Combinatorics of Words and Paths
  Authors: P. Blasiak, G. H. E. Duchamp, A. Horzela, K. A. Penson and A. I. Solomon (OWLF 2008)
- OWP 2009 - 01
  Title: Geometric Quantization of Integrable Systems with Hyperbolic SingularitiesAuthors: Mark D. Hamilton and Eva Miranda (OWLF 2008)

3. Sachlicher und Finanzieller Teil

3.1. Übersicht der Bereiche

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

Von besonderer Bedeutung ist dabei 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 Tag und Nacht zur Verfügung.

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

Zur Planung, Durchführung und Begleitung der wissenschaftlichen Programme waren am Institut etwa 20 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 Forschungprogramme rund um die Uhr geöffnet. Neben dem hohen internationalen Standard des wissenschaftlichen Programms und den exzellenten Rahmenbedingungen für den persönlichen Gedankenaustausch

3. General and financial statements

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 programme approximately 20 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 stays 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 Programme and the Oberwolfach Leibniz Fellow Programme, but also by the participants of the workshop programme. Repeatedly, mathematicians are visiting Oberwolfach in order to use literature to which the 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 programme and the excellent working conditions, the library is an important factor for the high reputation of the

ist die Bibliothek ein wichtiger Grund 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 das Förderprogramm „Literaturerwerbungen der DFG-Sondersammelgebiete und Spezialbibliotheken" der Deutschen Forschungsgemeinschaft (DFG) und durch Spenden der Carl Friedrich von Siemens Stiftung, sowie durch Sachspenden von Verlagen.

MFO worldwide. In times of dramatically increasing prices for scientific journals it is difficult to keep this level; this has only been possible because of support from the Deutsche Forschungsgemeinschaft (DFG), a donation from the Carl-Friedrich von Siemens Stiftung and book donations from publishing houses.

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.

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

3.2.1. Bestandsüberblick

Zum Jahresende 2009 belief sich der im elektronischen Katalog nachgewiesene Gesamtbestand an Büchern auf etwa 48.000 Bände. Hinzu kamen 28.000 Zeitschriftenbände. Darüber hinaus standen den Institutsgästen ca. 4.000 Dissertationen, 517 laufende Zeitschriften-Abonnements in gedruckter Form sowie über 3.000 lizenzierte elektronische Zeitschriften zur Verfügung.

3.2.1. Overview on the inventory

By the end of 2009 the stock of books included in our electronic catalogue totalled approx. 48,000 volumes and approx. 28,000 volumes of bound journals. In addition to that, approx. 4,000 dissertations, 517 current subscriptions to journals as well as 3,000 licensed electronic journals were available to the institute's guests.

3.2.2. Bestandsentwicklung

Der Bestand an Büchern wurde im Jahr 2009 um insgesamt 1.300 Bände vermehrt. Davon hat die Bibliothek 638 Bände im Rahmen der ständigen Buchausstellung erhalten. 158 Bücher wurden mit Mitteln der Deutschen Forschungsgemeinschaft (DFG) erworben. Mit Mitteln der Siemens Stiftung wurden 213 Bücher erworben.

3.2.2. Development of the inventory

The book inventory increased in 2009 by 1,300 volumes in total; 638 of these were donations for the permanent book exhibition. 158 volumes were financed through means of the Deutsche Forschungsgemeinschaft (DFG). 213 volumes were bought with means from the Siemens Stiftung.

Zum Jahresende 2009 hat das MFO 517 Zeitschriften laufend bezogen. Davon wurden 367 durch ein reguläres Abonnement gegen Rechnung bezogen, 73 Titel erhielten wir im Rahmen eines Tauschabkommens, 62 Titel erhielten wir als Geschenk.

By the end of 2009, the institute subscribed to 517 journals, 367 of those by regular subscription on account, 73 within an exchange agreement, and 62 as donations.

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 Nationallizenzen und bietet diese den einzelnen Einrichtungen kostenlos an. Das MFO hat im Rahmen dieser Nationallizenzen zusätzlich zu den etwa 540 regulären elektronischen Zeitschriftenabonnements weitere ca. 3.000 Zeitschriften elektronisch zur Verfügung stellen können.

In order to substantially improve the acquisition of digital scientific literature by German universities, research centres and scientific libraries, the DFG started in 2004 to finance national licenses and to offer them for free to the institutions. Within this programme of German national licenses the Institute has been able to provide further 4,000 electronic journals in addition to the 540 regular electronic subscriptions.

3.2.3. Buchausstellung

Die ständige Buchausstellung gibt interessierten wissenschaftlichen Verlagen die Möglichkeit, ihre Neuerscheinungen im Bereich Mathematik am MFO über einen längeren Zeitraum zu präsentieren. Einige der wichtigsten Verlagshäuser weltweit beteiligen sich teilweise mit ihrem gesamten mathematischen Programm daran. Insgesamt gingen 638 Bücher von 37 verschiedenen Verlagen im Rahmen der Buchausstellung in den Bibliotheksbestand ein.

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 2009 stark angewachsen. Neben den 562 institutseigenen Fotos kamen weitere aus verschiedenen Quellen hinzu. Besonders zu erwähnen sind hier die Bilder, die das MFO von Herrn Prof. Dr. Ernst Kunz, Regensburg, erhalten hat. Durch seine großzügige Unterstützung konnte die Fotosammlung um 156 Mathematikerportraits erweitert werden. Ende 2009 waren ca. 11.000 Fotos in der Datenbank enthalten.

3.2.5. DFG-Projekt: Oberwolfach Digital Archive

Das von der DFG seit September 2008 geförderte Projekt hat zum Ziel, die Vortragsbücher, Gästebücher, Tagungsberichte sowie weiteres, vorrangig archivarisches Material, das Geschichte und Arbeitsweise des MFO seit seiner Gründung 1944 dokumentiert, zu digitalisieren, formal und inhaltlich zu erschließen sowie durch Mikroverfilmung langfristig zu bewahren. Am Ende des Projekts wird eine umfassende Datenbank in Form eines Online-Archivs stehen, das über das Internet der Forschung frei zugänglich gemacht wird.
Im Laufe des Jahres 2009 wurde die Digitalisierung der o.g. Materialien abgeschlossen. Es liegen nun über 85.000 digitale Seiten in den Formaten .tif, .jpg. sowie .pdf vor. Zur weiteren Sicherung wurden auch zwei Mikrofilm-Sätze erstellt. Die formale Erschließung der Dokumente ist abgeschlossen. Herr Dr. Volker Remmert und Frau Dr. Maria Remenyi aus dem Fachbereich Physik, Mathematik und Informatik der Universität Mainz haben im Berichtsjahr begonnen, die Unterlagen inhaltlich zu erschließen. Dies wird später die Suche in den Materialien erheblich erleichtern, da hierbei auch Verbindungen zwischen den einzelnen Quellen sowie beispielsweise zur Fotodatenbank hergestellt werden sollen.

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 Institute over a longer period. Some of the most important publishing houses worldwide use this platform to present their programme in mathematical sciences. Consequently 638 books from 37 different publishing houses have become part of the library's inventory within the year 2009.

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 digitalised with the help of Springer Verlag, Heidelberg, and since then has been available for free on the internet with several research functions. The collection has grown again in 2009. Apart from the 562 institute-own photos, further pictures have come from various sources. Prof. Dr. Ernst Kunz, Regensburg, is to be specially mentioned here. Through his generous contribution the MFO was able to increase its photo collection by 156 portraits of mathematicians. By the end of 2009 the database listed approx. 11,000 photographs.

3.2.5. DFG project: Oberwolfach Digital Archive

This project is promoted by the DFG since September 2008 and aims at the digitisation, preservation, and long-term microfilm archiving of the old, hand-written lecture books, guest books , conference proceedings, and further archived documentation. These originals were collected since the foundation of the institute in 1944. Once the project is completed, a comprehensive database in the form of an online-archive will be freely available via internet for mathematical research.

During the year 2009 the digitisation of the material mentioned above was finished, resulting in over 85.000 digitised pages in the formats .tif, .jpg, and .pdf. For further backup two sets of microfilms were produced additionally.
The indexing of the documents in the state catalogue is finished. Dr. Volker Remmert and Dr. Maria Remenyi from the Department of Physics, Mathematics and Computer Science at the University of Mainz have started to index the content of the material. Later, this will enhance the search immensely, as this will generate connections between the different sources and for example also to the Oberwolfach Photo Collection.

3.2.6 De Gruyter E-Books

Mit dem Verlag Walter De Gruyter hat das MFO schon seit langer Zeit gute Beziehungen. So nimmt der Verlag an der Buchausstellung teil, wofür wir sehr dankbar sind. Dr. Sven Fund, CEO bei De Gruyter, hat uns im Laufe des Sommers 2009 den Zugang zu den mathematischen E-Books der Jahre 2007-2008 ermöglicht. Wir danken De Gruyter und vor allem Herrn Dr. Fund ganz herzlich für diese großzügige Unterstützung.

3.3. IT-Bereich

Zweck der IT am MFO ist, den Gastforschern und den Verwaltungsmitarbeitern effiziente Arbeitsmöglichkeiten zu bieten. Neben den üblichen Kommunikationsmitteln – Web, E-Mail, Remote Login, Dateitransfer, Office-Produkte – beinhaltet dies Literaturrecherche und Zugriff auf online verfügbare Fachzeitschriften, die Nutzung mathematischer Software auf einem Computeserver, sowie die technische Ausstattung von Vortragssälen und Bibliothek. Darüber hinaus stehen die Webdienste des MFO der Gesamtheit der Wissenschaftler zur Verfügung.

Den Mitarbeitern stehen datenbankgestützte Anwendungen für die Verwaltung der Tagungen, der Bibliothek und der Finanzen zur Verfügung.

Die Webdienste des Instituts umfassen
- die regulären Webseiten
- die Oberwolfach References on Mathematical Software
- die Fotosammlung
- den Bibliothekskatalog
- die Oberwolfach Reports
- die elektronischen Abonnements für anwesende Nutzer

3.3.1. Bestand Ende 2009

Hardware
- Internetanbindung über das Deutsche Forschungsnetz (DFN-Verein) mit einer 20 Mbit/s Standleitung
- LAN mit Gigabit Ethernet Backbone und Fast Ethernet Peripherie, in 3 Gebäuden 5 Knoten mit ca. 150 Twisted Pair Anschlüssen und 4 WLAN Access Points
- 12 Server, teils für zentrale Dienste, teils als Terminal Server für die Arbeitsplätze
- Im Wissenschaftsbereich 23 fest installierte Arbeitsplätze, 15 Laptoparbeitsplätze, 11 Zimmer mit Netzwerkanschluß, WLAN
- Im Verwaltungsbereich 13 Arbeitsplätze

Software

Auf dem für alle Gastforscher zugänglichen

3.2.6 De Gruyter E-Books

The MFO has maintained good relations with the publisher Walter De Gruyter for a long time. For example, the publisher takes part in the Book Exhibition Programme, which we are very thankful for. In the summer of 2009, Dr. Sven Fund, CEO at De Gruyter, has made it possible that we received access to the mathematical E-Books of the years 2007-2008. We thank De Gruyter and especially Dr. Fund most sincerely for this generous donation.

3.3. IT Division

The purpose of the IT at the MFO is to provide guest researchers and administrative staff with efficient working conditions. Besides the usual communication media – web, e-mail, remote login, file transfer, office products – this also comprises retrieval of literature and access to online scientific journals, the use of mathematical software on an application server, and finally the technical equipment of lecture rooms and the library. In addition, the web services of the MFO are at the disposal of the whole scientific community.

Staff members use databased applications for the administration of conferences, library and financial accounting.

The web services of the Institute comprise
- the regular web pages
- the Oberwolfach References on Mathematical Software
- the Oberwolfach Photo Collection
- the library catalogue
- the Oberwolfach Reports
- the subscribed electronic journals for local users.

3.3.1. Stock by the end of 2009

Hardware
- Internet connection via the Deutsches Forschungsnetz (DFN-Verein) with a 20 Mbit/s leased line
- LAN with Gigabit Ethernet backbone and Fast Ethernet periphery, with 5 nodes in 3 buildings with about 150 Twisted Pair connectors and 4 wireless access points
- 12 servers, partly for central services, partly as terminal server for the workplaces
- In the scientific subnet: 23 fixed terminals, 15 workplaces for laptops, 11 rooms with network connection, wireless network
- In the administrative subnet: 13 workplaces

Software

On the application server, accessible to all guest

Computeserver sind etwa 10 der am meisten nachgefragten wissenschaftlichen Softwaresysteme installiert, sowohl kommerzielle wie Maple, Mathematica und Magma als auch freie wie Singular, GAP, Cocoa und Surfer.

Schon Ende der achtziger Jahre wurde wegen der speziellen Anforderungen des Tagungsbetriebs am MFO eine datenbankgestützte Software entwickelt. Ferner wird die Finanzbuchhaltungs- und Finanzplanungssoftware Office Line 100 der Firma Sage sowie mit Unterstützung des Bibliotheksservicezentrums des Südwestdeutschen Bibliotheksverbundes (BSZ) die Bibliothekssoftware Horizon am MFO eingesetzt.

3.3.2. Entwicklungen und Neuerungen im Jahr 2009

Das Kernstück der IT-gestützten Verwaltung ist seit vielen Jahren die Tagungsverwaltungssoftware, die stark in die Arbeitsläufe und IT-Prozesse am MFO integriert ist. Ihre Ablösung durch eine moderne datenbankbasierte Webanwendung ist derzeit das wichtigste und umfangreichste Projekt. Aufgrund der speziellen Anforderungen fiel die Entscheidung wiederum zugunsten einer Eigenentwicklung. Dazu haben 2009 zahlreiche Arbeiten stattgefunden. Der produktive Einsatz ist für das vierte Quartal 2010 geplant.

Die Konsolidierung der Serverlandschaft wurde geplant und die nötige Hardware beschafft: Die konventionellen Server werden durch virtuelle Server ersetzt; sämtliche Nutzerdaten und Systemdaten werden in einen zentralen Datenspeicher überführt. Dadurch werden eine höhere Flexibilität, höhere Leistungsfähigkeit und eine bessere Auslastung der Ressourcen bei gleichzeitiger Reduzierung von Geräteanzahl und Stromverbrauch erreicht.

Die Internetanbindung wurde durch ein neue, jetzt redundant ausgelegte Firewall geschützt.

Im Rahmen des Projekts „Oberwolfach Leibniz Graduate Students" (siehe 2.1.) können die Tagungsleiter jetzt im Bestand der Kandidaten recherchieren.

Für Mitarbeiter wurde ein eingeschränkter VPN-Zugriff von außerhalb auf die IT-Ressourcen des Instituts eingerichtet.

Den zunehmenden materiellen und rechtlichen Gefahren des IT-Betriebs wurde durch die Schulung eines IT-Sicherheitsbeauftragten sowie eine erste Analyse der Sicherheitslage Rechnung getragen. Wichtig ist aber, bei

researchers, about 10 of the most popular mathematical software systems are installed, both commercial ones such as Maple, Mathematica, and Magma and freely distributed ones such as Singular, GAP, Cocoa and Surfer.

Already in the late 1980s a databased software was developed for the special requirements of organising the scientific programme at the MFO. The financial accounting and planning software Sage OfficeLine 100, and, supported by the Bibliotheksservicezentrum of the Südwestdeutscher Bibliotheksverbund (BSZ), the librarian software Horizon is used at the MFO.

3.3.2. Developments and innovations in 2009

Since many years the conference management software is the core of the IT-based administration, highly integrated into the workflows at the MFO. To replace it by a modern databased web application is the most important and the most involved of the current projects. Because of its special requirements it was decided once again to develop it in-house. In 2009 many steps have been taken to this end. The deployment is planned to start in the fourth quarter of 2010.

The restructuring of our server system has been planned and necessary hardware has been procured. The conventional servers have been replaced by virtual ones, and all user and system data have been transferred into a central data storage, thus ensuring a higher flexibility and performance and an improved utilization of the resources along with a reduction of the server units and power consumption.

The internet connection is now protected by a redundant firewall.

In order to be able to select suitable candidates for the project Oberwolfach Leibniz Graduate Students (see 2.1.) organisers of an Oberwolfach Workshop can now make use of our especially designed database.

A limited external VPN access to the MFO's IT resources has been made availalable to the staff.

With the training of a safety officer and with a first analysis of the security situation we have met the problem of the increasing substantial and legal risks to which the IT service is exposed to.. Despite the safety measures to be taken the

Sicherheitsmaßnahmen den für die Gastforscher freien und effizienten Charakter des Instituts zu wahren.

free and efficient character of the Institute must be preserved for our guest researchers.

Bei der Planung und Durchführung der Sanierung des Gästehauses und der Bungalows wurde auf eine nahtlose Integration der IT-Infrastruktur geachtet. Insbesondere wurde die Ausstattung für spätere Erweiterungen offen gehalten.

The full integration of the IT infrastructure has been taken into account at the refurbishment of the guest house and the bungalows. As provision for further development the flexibility of the equipment has been emphasised.

Das Projekt Oberwolfach Digital Archive (siehe 3.2.5.) wurde in seiner bisherigen Durchführung intensiv unterstützt. Ziel ist die digitale Erfassung historisch wertvoller Dokumente – Vortragsbücher, Tagungsberichte, Gästebücher – seit Gründung des Instituts, ihre inhaltliche Erschließung und die allgemeine Verfügbarmachung in einem Webportal. Zum Einsatz kommt die Software SWBcontent des BSZ des baden-württembergischen Bibliotheksverbundes, das Daten und Webportal auch hosten wird. Die inhaltliche Arbeit findet durch die Projektmitarbeiter in Oberwolfach, Mainz und Kaiserslautern statt.

During its realisation the project Oberwolfach Digital Archive (see 3.2.5.) has been intensely supported by the IT division. Its goal is to digitally capture documents of historic value —lecture notes, conference proceedings, guest books— to do subject indexing and to publish them by means of a web portal. For this purpose, the software SWBcontent of the Sercive Center (BSZ) of the Südwestdeutscher Bibliotheksverbund was chosen. The Service Center will also host the data and run the web portal. The work as regards content will be done by project staff members in Oberwolfach, Mainz, and Kaiserslautern.

Einbezogen war der IT-Bereich auch in die Umsetzung der Wanderausstellung IMAGINARY und die Eröffnung des Museums MiMa für Mineralien und Mathematik in Oberwolfach, in dem mathematiische Exponate und interaktive Stationen mit der bestehenden Mineraliensammlung kombiniert werden.

Finally the IT division was involved in the exhibition IMAGINARY and the opening of MiMa, a museum in Oberwolfach joining interacive mathematical exhibits with the established collection of minerals.

3.3.3. ORMS

Mathematische Software entwickelte sich in den letzten zwanzig Jahren zu einem etablierten Werkzeug mathematischer Forschung und Lehre, deren Stellenwert in einigen Bereichen inzwischen dem der mathematischen Literatur vergleichbar ist. Doch es gab bisher nur rudimentäre Sammlungen mathematischer Software. Die „Oberwolfach References on Mathematical Software" (ORMS) sollen diese Lücke schließen. Dies beinhaltet einerseits eine web-basierte Sammlung von detaillierten Informationen und Querverweisen, andererseits ein Klassifikationsschema mathematischer Software, das die gesamte thematische Breite mathematischer Software erfassen soll.

3.3.3. ORMS

During the last twenty years, mathematical software has become an established tool in mathematical research and education. In some fields, its importance is comparable to that of mathematical literature. However, collections of mathematical software so far only exist in a rudimentary manner. The intention of the 'Oberwolfach References on Mathematical Software' (ORMS) project is to fill this gap. This includes a web-interfaced collection of detailed information and links on the one hand, and on the other hand a classification scheme for mathematical software eventually aiming to cover all thematic aspects of mathematical software.

Die in den ORMS dokumentierten Systeme sind sorgfältig ausgewählt und umfassen sowohl Mehrzweck- als auch spezialisierte Systeme bis hin zu spezifischen Implementierungen von Algorithmen für besondere mathematische Forschungsprobleme, und auch Lehrsoftware. Die Benutzer können die Aufnahme weiterer Softwaresysteme in die Datenbank vorschlagen. Die Entscheidung darüber trifft der wissenschaftliche Beirat der

The systems documented in ORMS are carefully selected and comprise general purpose software systems, teaching software, as well as more specialized packages, up to specific implementations of algorithms for particular mathematical research problems. ORMS users can suggest the inclusion of further software systems into the database. The ORMS advisory board decides on these proposals. Registered authors can edit their projects directly

ORMS. Registrierte Autoren können ihre Projekte in der ORMS-Datenbank direkt bearbeiten. Weitere Informationen finden sich auf der Homepage, http://orms.mfo.de.

in the ORMS database. More information can be found on the ORMS web page, http://orms.mfo.de.

Im Jahr 2009 hat die neue Generation des ORMS-Applikationsservers von 2008 erheblich an Reife gewonnen. Weiterhin ist die Anzahl der Projekte in den Oberwolfach References on Mathematical Software bis Ende 2009 auf 70 angewachsen.

In 2009 the generation of the ORMS application server has become much more mature. Furthermore, the number of projects described in the Oberwolfach References on Mathematical Software has increased to 70 until the end of 2009.

Das ORMS-Projekt wird durch Gert-Martin Greuel geleitet und koordiniert; verantwortlich für die Entwicklung ist Michael Brickenstein.

The ORMS project is directed and coordinated by Gert-Martin Greuel, and Michael Brickenstein is responsible for support and development.

ORMS Advisory board

Arjeh M. Cohen	(Computational Algebra, Lie groups, OpenMath)
Iain S. Duff	(Numerical Linear Algebra, Sparse Matrices)
Andreas Griewank	(Nonlinear Optimization, Algorithmic/Automatic Differentiation)
Wolfgang Härdle	(Statistics, Econometrics)
Michael Joswig	(Geometric Combinatorics, Polyhedral Computation, Computational, Geometry, Discrete and Linear Optimization)
Erich Kaltofen	(Straight-line Program/Black-Box Representation, Symbolic Linear Algebra, Symbolic-numeric Computation, Generic Software)
Nobuki Takayama	(Computational Algebraic Analysis, Integration of Mathematical Software Systems)

3.4. Zu Verwaltung und Hauswirtschaft

Aufgrund der Beschlüsse der Bund-Länder-Kommission für Bildungsplanung und Forschungsförderung 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 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.

Der Verwaltungsbereich umfasst derzeit 8,95 besetzte Stellen für die wissenschaftliche Verwaltung (Organisation der Workshops), die Bibliothek, die IT sowie für die allgemeine Verwaltung (Finanzverwaltung, Beschaffungswesen, Personalsachbearbeitung, Vertragswesen, Bausanierung, 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-Programmes und des neuen Oberwolfach-Leibniz-Fellows-Programmes möglich. Der Hauswirtschaftsbereich umfasst insgesamt 12,25 Stellen für Küche und Zimmerservice sowie für die Pflege von Gebäuden und Grundstück. Aufgrund ihres Alters ist vor allem die Pflege der Gebäude von größter Bedeutung.

Im Haushaltsjahr 2009 konnte durch die Unterstützung von Bund und Sitzland mit der dringend notwendigen Sanierung des Gästehauses begonnen werden. Die Maßnahmen sollen im Frühjahr 2010 abgeschlossen werden.

3.4. Administration and House-keeping

According to the resolution of the Federal State-Länder-committee for education and research, 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 VolkswagenStiftung. Hosting the library, several lecture halls and numerous computer stations it offers excellent working conditions for scientific research. The offices of the scientific administration are also part of this building. The extension of the library, funded by the Klaus Tschira Stiftung and the VolkswagenStiftung 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.

The administration encompasses at he moment 8.95 positions, covering scientific administration (planning and organisation of the scientific programme), 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 realisation of the scientific programme at the MFO. The guest house was built with funds from the VolkswagenStiftung 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 programme and the Oberwolfach-Leibniz-Fellows programme. The housekeeping department comprises 12.25 positions for kitchen and room service as well as for the maintenance of the buildings and premises. Due to their age, particularly the maintenance of the buildings is of greatest importance.

Due to the support of the federation and the Land Baden-Württemberg the renovation measures of the guest house could be started in 2009. The measures should be finished in spring 2010.

3.5. Finanzielle Übersicht 2009 3.5. Financial Overview 2009

Gesamtübersicht

General Overview

Erlöse 2009 (gerundet auf 1.000 Euro)	**Revenues 2009** (rounded)	
Zuwendung Bund/Länder (inkl. Mittel für Bausanierung)	Benefits from the federation/federal states (incl. subsidy for renovation measures)	4.290.000
Drittmittel	Third party funds	354.000
Spenden	Donations	87.000
Sonstige Einnahmen	Other income	115.000
Zweckgebundene Reste aus 2008	Earmarked surpluses	84.000
Summe Erlöse:	**Total revenues:**	**4.930.000**

Aufwendungen 2009 (gerundet auf 1.000 Euro)	**Expenses 2009** (rounded)	
Personalausgaben	Personnel department	1.060.000
Materialaufwand	Purchases	326.000
Aufwand für bezogene Leistungen (inkl. Bausanierungsmaßnahmen Gästehaus und energetischer Sanierung der Bibliothek)	Expenses for drawn benefits (incl. renovation of buildings and energetic remediation of the library)	1.783.000
Abschreibungen	Consumption of fixed capital	42.000
Sonstige Aufwendungen (inkl. Sachausgaben Bibliothek)	Other expenses (incl. material expenses for the library)	988.000
Rückstellungen für zweckgebundene Reste (Sanierung und Drittmittel)	Provisions for earmarked surpluses (Renovation an third party funds)	615.000
Investitionen	Investments	116.000
Summe Aufwendungen:	**Total expenses:**	**4.930.000**

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 2009 bei 13 %. Der im Verhältnis zum Vorjahr geringere Prozentsatz ergibt sich aus den sehr hohen Zuwendungen für die Sanierungsmaßnahmen in Höhe von 2,8 Millionen Euro.

Öffentliche Mittel
Das MFO erhielt im Haushaltsjahr 2009 insgesamt 4,290 Millionen Euro Zuwendung von Bund und Ländern.

Drittmittel
Die projektbezogenen Drittmittel rekrutierten sich im Haushaltsjahr 2009 insbesondere aus Mitteln der Deutschen Forschungsgemeinschaft (DFG), der National Science Foundation (NSF), der Japan Association of Math. Sciences (JAMS) und Mitteln des Bundesministeriums für Bildung und Forschung (BMBF) für die Ausstellung „IMAGINARY".

Förderverein und Oberwolfach Stiftung
Zweckgebundene Spenden erhielt das MFO auch im Haushaltsjahr 2009 vom Förderverein und der Oberwolfach Stiftung. Die Gelder wurden für Reisekostenzuschüsse für osteuropäische Wissenschaftler und als Zuschuss für die Sanierungsmaßnahmen verwendet.

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 13 %. Due to the very high benefits for the renovation measures (2.8 million Euros), the percentage is smaller than it was in the previous year.

Public Funding
In the fiscal year 2009 the MFO received 4.290 million Euro funding from the federation and the federal states.

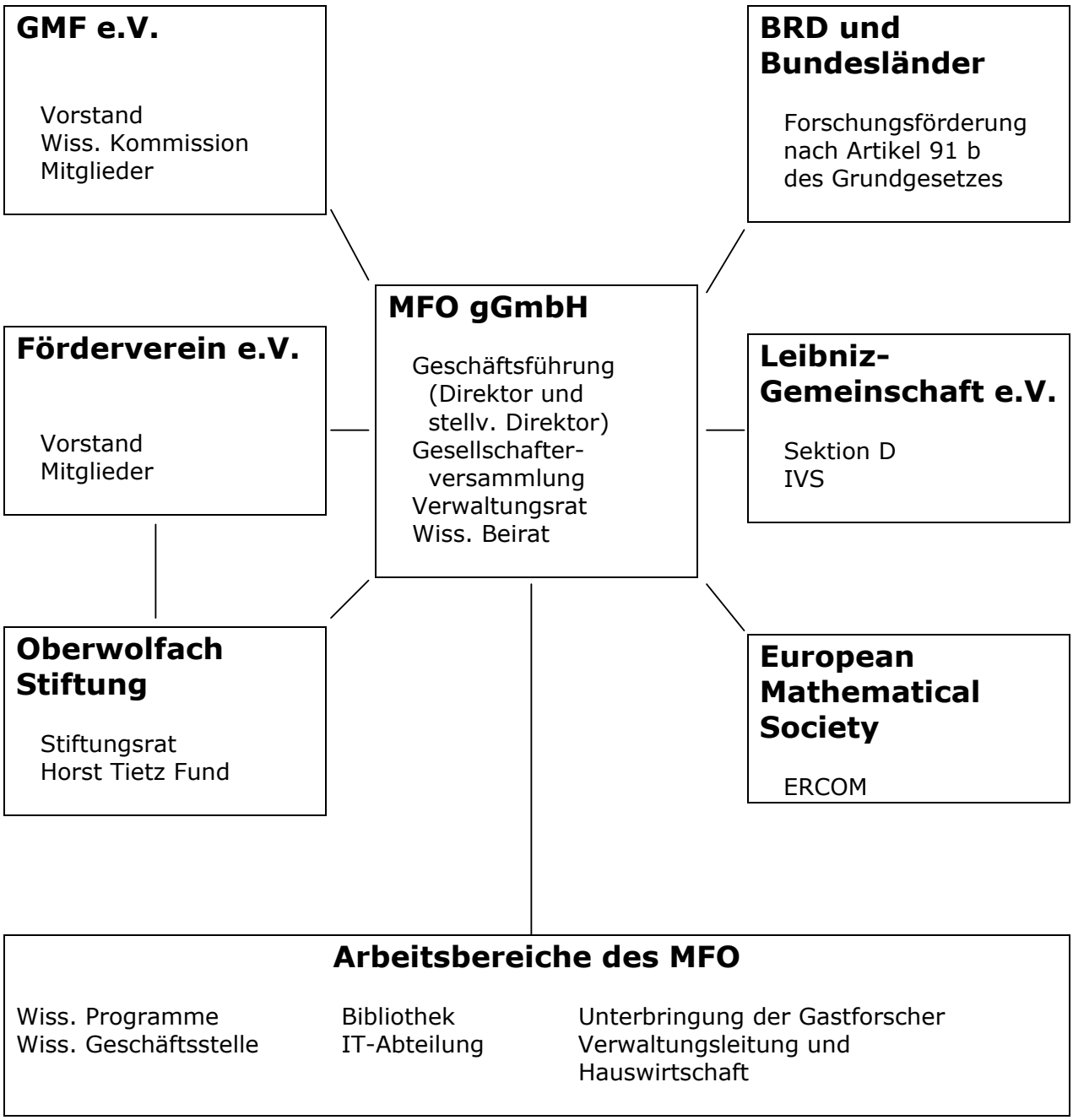
Third-party funds
Earmarked third party funds in the fiscal year 2009 are mainly composed of the grants from the Deutschen Forschungsgemeinschaft (DFG), the National Science Foundation (NSF), the Japan Association of Mathematical Sciences (JAMS) and the funds from the German Federal Ministry of Research (BMBF) for the exhibition „IMAGINARY".

Förderverein and Oberwolfach Stiftung
Earmarked donations have been received by the Förderverein and the Oberwolfach Stiftung. These funds have been used to support Eastern European scientists and as additional support for the renovation measures.

3.6. Dank
Ein besonders herzliches Dankeschön gilt den Zuwendungsgebern, insbesondere dem Land Baden-Württemberg und dem Bund für die umfangreichen Mittel, die für die Generalsanierung zur Verfügung gestellt wurden. Weiter gilt unser Dank allen Drittmittelgebern wie der Deutschen Forschungsgemeinschaft (DFG), der Carl Friedrich von Siemens Stiftung, der National Science Foundation (NSF), der Japan Association of Math. Science (JAMS) und dem Bund für die nochmalige Unterstützung unserer Ausstellung IMAGIANRY im Jahr 2009. Und ein Dankeschön natürlich auch an den Förderverein und die Oberwolfach Stiftung für die großzügige Unterstützung des MFO.

3.6. Acknowledgement
Finally, we would like to express our sincerest thanks to the Federation and the Land of Baden-Württemberg for their considerable financial support for the refurbishment of our Insitute. We would also like to thank for the third-party funds received from the Deutsche Forschungsgemeinschaft (DFG), the Carl Friedrich von Siemens Stiftung, the National Science Foundation (NSF), the Japan Association of Math. Sciences (JAMS) and again the Federation for the support of our exhibition IMAGINARY in 2009. Our special thank you also goes to the Förderverein and the Oberwolfach Foundation for their important support of the MFO.

3.7. Organigramm des Mathematischen Forschungsinstituts Oberwolfach



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 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.

Die Gesellschaft für mathematische Forschung e.V. (GMF) hat ca. 70 Mitglieder, darunter die drei institutionellen Mitglieder DMV (Deutsche Mathematiker-Vereinigung), GAMM (Gesellschaft für angewandte Mathematik und Mechanik) 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 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.

Der Verein zur Förderung des Mathematischen Forschungsinstituts Oberwolfach e.V. (Förderverein) hat mehr als 700 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.

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-Gemeinschaft 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 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.

The Gesellschaft für mathematische Forschung e.V. (GMF) consists of about 70 members, including three institutional members, namely DMV (Deutsche Mathematiker-Vereinigung), GAMM (Gesellschaft für angewandte Mathematik und Mechanik) 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 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.

The Verein zur Förderung des Mathematischen Forschungsinstituts Oberwolfach e.V. (Förderverein) has more than 700 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.

Beschäftigte des MFO — Staff of the MFO — (2009)

Wissenschaftliche Verwaltung	**Scientific Administration**	
Direktor	Director	Prof. Dr. Dr. h.c. Gert-Martin Greuel
Stellvertretender Direktor	Vice Director	Prof. Dr. Horst Knörrer
Assistent des Direktors	Assistant to the Director	PD Dr. habil. Stephan Klaus
Externer Assistent	External Assistant	Dr. Andreas D. Matt
Sekretärin für Workshops	Secretary for Workshops	Silke Okon
Sekretärin für Workshops	Secretary for Workshops	Andrea Schillinger
Sekretärin für RiP und Seminare	Secretary for RiP and Seminars	Petra Bäsell
Verwaltung	**Administration**	
Verwaltungsleitung	Head of Administration	Susanne Riester
Sekretärin im Gästebüro	Secretary in the Guest Office	Katrin Breithaupt
Sekretärin im Gästebüro	Secretary in the Guest Office	Annette Disch
Bibliothekarin	Librarian	Verena Franke/ Ivonne Vetter
Sekretärin der Bibliothek	Library Secretary	Renate Schmid
Systemverwalter	System Administrator	Helmut Kastenholz
Software Entwickler	Software Developer	Michael Brickenstein
Hauswirtschaft	**Housekeeping**	
Hauswirtschaftsleiterin	Housekeeping Manager	Charlotte Endres
Hausmeister	Caretaker	Helmut Breithaupt
Weitere Beschäftigte	Further Housekeeping Staff	(ca. 10 Personen)

Verwaltungsrat des MFO/Administrative Council of the MFO
(Mitglieder/Members 2009)

Tania Bolius	Ministerium für Wissenschaft, Forschung und Kunst, Stuttgart, (Vorsitzende/Chair)
Dr.-Ing. Heike Prasse	Bundesministerium für Bildung und Forschung, Bonn, (stellvertretender Vorsitzender/Vice Chair)
Prof. Dr. Jean-Pierre Bourguignon	Director of the Institut des Hautes Études Scientifiques, Bures-sur-Yvette
Prof. Dr. Dr. h.c. mult. Willi Jäger	Interdisziplinäres Zentrum für wiss. Rechnen und Institut für angewandte Mathematik, University of Heidelberg
Prof. Dr. Hanspeter Kraft	Mathematisches Institut, University of Basel
Dr. Wilhelm Krull/	Generalsekretär der VolkswagenStiftung, Hannover
Dr. Inda Willms-Hoff	VolkswagenStiftung, Hannover
Prof. Dr. Stefan Müller	Max Planck Institute for Mathematics in the Sciences, Leipzig
Friedrich Simson	Ministerium für Wirtschaft und Wissenschaft, Saarbrücken
Dr. h.c. Klaus Tschira	Geschäftsführer der Klaus Tschira Stiftung gGmbH, Heidelberg

Wissenschaftlicher Beirat des MFO/Scientific Advisory Board of the MFO
(Mitglieder/Members 2009)

Prof. Dr. Stefan Müller, Leipzig (Chair)
Prof. Dr. Frances C. Kirwan, Oxford (Vice Chair)
Prof. Dr. Ingrid Daubechies, Princeton
Prof. Dr. Björn Engquist, Austin/Stockholm
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Lectures on the $\mathscr{L}^2$-Sobolev Theory of the $\bar{\partial}$-Neumann Problem (ESI Lectures in Mathematics and Physics)

ISBN 978-3-03719-076-0. 2010. 214 pages. Hardcover. 17 x 24 cm. 42.00 Euro

This book provides a thorough and self-contained introduction to the $\bar{\partial}$-Neumann problem, leading up to current research, in the context of the $\mathscr{L}^2$-Sobolev theory on bounded pseudoconvex domains in $\mathbb{C}^n$. It grew out of courses for advanced graduate students and young researchers given by the author at the Erwin Schrödinger International Institute for Mathematical Physics and at Texas A&M University.

The introductory chapter provides an overview of the contents and puts it in historical perspective. The second chapter presents the basic $\mathscr{L}^2$-theory. Following is a chapter on the subelliptic estimates on strictly pseudoconvex domains. The two final chapters on compactness and on regularity in Sobolev spaces bring the reader to the frontiers of research. Prerequisites are a solid background in basic complex and functional analysis, including the elementary $\mathscr{L}^2$-Sobolev theory and distributions. Some knowledge in several complex variables is helpful. Concerning partial differential equations, not much is assumed.

Helge Holden (Norwegian University of Science and Technology, Trondheim, Norway), Kenneth H. Karlsen, Knut-Andreas Lie and Nils Henrik Risebro (all University of Oslo, Norway)
Splitting Methods for Partial Differential Equations with Rough Solutions. Analysis and MATLAB programs (EMS Series of Lectures in Mathematics)

ISBN 978-3-03719-078-4. 2010. 234 pages. Softcover. 17 x 24 cm. 36.00 Euro

Operator splitting (or the fractional steps method) is a very common tool to analyze nonlinear partial differential equations both numerically and analytically. By applying operator splitting to a complicated model one can often split it into simpler problems that can be analyzed separately. In this book one studies operator splitting for a family of nonlinear evolution equations, including hyperbolic conservation laws and degenerate convection-diffusion equations. Common for these equations is the prevalence of rough, or non-smooth, solutions, e.g., shocks.

The theory is illustrated by numerous examples. There is a dedicated web page that provides MATLAB codes for many of the examples. The book is suitable for graduate students and researchers in pure and applied mathematics, physics, and engineering.

Eduard Zehnder (ETH Zürich, Switzerland)
Lectures on Dynamical Systems (EMS Textbooks in Mathematics)

ISBN 978-3-03719-081-4. 2010. 363 pages. Hardcover. 16.5 x 23.5 cm. 48.00 Euro

This book originated from an introductory lecture course on dynamical systems given by the author for advanced students in mathematics and physics at the ETH Zurich. The first part centres around unstable and chaotic phenomena caused by the occurrence of homoclinic points. The second part of the book is devoted to Hamiltonian systems. The Hamiltonian formalism is developed in the elegant language of the exterior calculus. The theorem of V. Arnold and R. Jost shows that the solutions of Hamiltonian systems which possess sufficiently many integrals of motion can be written down explicitly and for all times. The existence proofs of global periodic orbits of Hamiltonian systems on symplectic manifolds are based on a variational principle for the old action functional of classical mechanics. There is an intimate relation between the periodic orbits of Hamiltonian systems and a class of symplectic invariants called symplectic capacities. From these symplectic invariants one derives surprising symplectic rigidity phenomena. This allows a first glimpse of the fast developing new field of symplectic topology.

Vladimir Turaev (Indiana University, Bloomington, USA)
Homotopy Quantum Field Theory (EMS Tracts in Mathematics Vol. 10)

ISBN 978-3-03719-086-9. 2010. 290 pages. Hardcover. 17 x 24 cm. 58.00 Euro

Homotopy Quantum Field Theory (HQFT) is a branch of Topological Quantum Field Theory founded by E. Witten and M. Atiyah. It applies ideas from theoretical physics to study principal bundles over manifolds and, more generally, homotopy classes of maps from manifolds to a fixed target space. This book is the first systematic exposition of Homotopy Quantum Field Theory. It starts with a formal definition of an HQFT and provides examples of HQFTs in all dimensions. The main body of the text is focused on 2-dimensional and 3-dimensional HQFTs. A study of these HQFTs leads to new algebraic objects: crossed Frobenius group-algebras, crossed ribbon group-categories, and Hopf group-coalgebras. These notions and their connections with HQFTs are discussed in detail. The text ends with several appendices including an outline of recent developments and a list of open problems. Three appendices by M. Müger and A. Virelizier summarize their work in this area.

The book is addressed to mathematicians, theoretical physicists, and graduate students interested in topological aspects of quantum field theory.

Hans Triebel (Friedrich-Schiller-Universität Jena, Germany)
Bases in Function Spaces, Sampling, Discrepancy, Numerical Integration (EMS Tracts in Mathematics Vol. 11)

ISBN 978-3-03719-085-2. 2010. 305 pages. Hardcover. 17 x 24 cm. 58.00 Euro

The first chapters of this book deal with Haar bases, Faber bases and some spline bases for function spaces in Euclidean n-space and n-cubes. This is used in the subsequent chapters to study sampling and numerical integration preferably in spaces with dominating mixed smoothness. The subject of the last chapter is the symbiotic relationship between numerical integration and discrepancy, measuring the deviation of sets of points from uniformity.

This book is addressed to graduate students and mathematicians having a working knowledge of basic elements of function spaces and approximation theory, and who are interested in the subtle interplay between function spaces, complexity theory and number theory (discrepancy).

European Congress of Mathematics, Amsterdam, 14–18 July, 2008
A.C.M. Ran (VU University Amsterdam, The Netherlands), Herman te Riele (Centrum voor Wiskunde en Informatica, The Netherlands) and Jan Wiegerinck (University of Amsterdam, The Netherlands), Editors

ISBN 978-3-03719-077-7. 2010. 488 pages. Hardcover. 16.5 x 23.5 cm. 78.00 Euro

The Fifth European Congress of Mathematics (5ECM) took place in Amsterdam, The Netherlands, July 14–18, 2008, with about 1000 participants from 68 different countries. Ten plenary and thirty-three invited lectures were delivered. Three science lectures outlined applications of mathematics in other sciences: climate change, quantum information theory and population dynamics. As in the four preceding EMS congresses, ten EMS prizes were granted to very promising young mathematicians. In addition, the Felix Klein Prize was awarded, for the second time, for an application of mathematics to a concrete and difficult industrial problem. There were twenty-two minisymposia, spread over the whole mathematical area. Two round table meetings were organized: one on industrial mathematics and one on mathematics and developing countries. These proceedings contain a selection of the contributions to the congress, providing a permanent record of the best that mathematics offers today.

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The present collection of four lecture notes is the very first contribution of this type in the field of sparse recovery. Compressed sensing is one of the important facets of the broader concept presented in the book, which by now has made connections with other branches such as mathematical imaging, inverse problems, numerical analysis and simulation.

Vladimir G. Turaev

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