

CENTRE DE RECERCA MATEMÀTICA
MEMÒRIA D'ACTIVITATS 2009
REPORT OF ACTIVITIES 2009



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Presentació

A l'hora de fer un repàs del que s'ha esdevingut al CRM durant l'any 2009, cal assenyalar especialment els actes de commemoració del 25è aniversari del Centre. Varen ser dos: l'acte institucional del 27 d'abril a L'Auditori de Barcelona, presidit pel Molt Honorable President de la Generalitat de Catalunya, Sr. José Montilla, i l'acte acadèmic (*CRM Open Day*) celebrat el 27 de novembre a la seu de l'Institut d'Estudis Catalans. Amb l'èxit d'ambdós actes, crec que el CRM va tenir la visibilitat i el reconeixement que li corresponen per la seva trajectòria al llarg d'aquests vint-i-cinc anys i com a centre degà entre els de la xarxa CERCA de centres participants pel Govern de la Generalitat. En aquesta memòria trobareu informació detallada de la programació de cadascun d'aquests dos actes.

Durant el 2009 el CRM ha seguit per segon any el full de ruta que és el pla estratègic contemplat en el contracte programa signat amb el DIUE per al període 2008-2013. A grans trets, i tal i com ja assenyalava l'any passat, aquest pla estratègic defineix un CRM amb dues cares: el CRM de sempre, com a centre de serveis a la comunitat, i el CRM com a impulsor de recerca estratègica deficitària a Catalunya mitjançant la contractació d'investigadors propis. En tots dos aspectes el CRM ha acomplert amb escreix les previsions. En el primer, com veureu a la memòria, el flux de visitants ha estat molt significatiu. També les activitats organitzades pel CRM durant l'any 2009 han estat moltes i variades, totes sobre una base competitiva, i han gaudit un any més de finançament del projecte Ingenio Mathematica (i-MATH). En el segon aspecte, han començat a agafar forma dos grups de recerca emergents al CRM (Matemàtica industrial i Sistemes complexos). El grup de Matemàtica financera ha tingut noves incorporacions però també una baixa assenyalada, i s'han posat les bases per bastir un grup en Biologia matemàtica durant l'any 2010.

Cal destacar que l'any 2009 ha vist també el començament de les obres d'ampliació del Centre, gràcies a les quals passarà de 1.200 a 2.100 m². Aquestes obres, que gaudeixen de finançament FEDER i estan recolzades des del punt de vista financer pel DIUE, estaran enllestides l'octubre de 2010.

Joaquim Bruna
Director



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Presentation

When surveying the CRM's activities during 2009, special attention should be paid to the two events organised to celebrate the 25th anniversary of the Centre. The first was an institutional ceremony held on April 27th at L'Auditori de Barcelona, which was presided over by the President of the Generalitat de Catalunya, José Montilla. The second was an academic meeting, the CRM Open Day, which took place on November 27th at the Institut d'Estudis Catalans. Both were successful events, and through them the CRM achieved the visibility and public recognition that it deserves for its trajectory during the past 25 years and as a pioneer among the CERCA centres currently sponsored by the Catalan Government. Detailed information about both events can be found in this Report of Activities.

During 2009 the CRM has continued to develop the scientific policy outlined in the strategic plan included in the contract programme with DIUE for the period 2008-2013. As explained in the 2008 Report of Activities, this strategic plan involves two different aspects of the Centre's role: the traditional role, as a service centre for the mathematical community, and a new role as an active agent promoting modern mathematical research that is poorly represented in Catalonia by appointing its own researchers. In both directions the CRM has achieved the goals outlined in the contract programme. As can be seen in the present report, the flow of visitors in 2009 has been significant; there have also been many activities organised during the year, all on a competitive basis, covering a wide variety of subjects. We have benefited once again from financial support of the state project Ingenio Mathematica (*i-MATH*) to organise many of our activities. Regarding the second role, there now exist two growing research groups at the CRM, working in Industrial Mathematics and Complex Systems, respectively. The CRM's research group in Mathematical Finance has had new appointments but also a significant loss. Finally, we have laid the foundations for developing a research group in Mathematical Biology.

It is also noteworthy that construction work began in 2009 for the enlargement of the CRM's premises. Once completed, the Centre will gain 900 additional square metres. This work is supported by the FEDER programme of the European Union and by the DIUE from Generalitat de Catalunya, and is due to be finished by October 2010.

Joaquim Bruna
Director



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Descripció del Centre

Description of the CRM

1

1.1. Missió i objectius

L'objectiu definit als estatuts del CRM és la recerca i la formació avançada en l'àmbit de les matemàtiques, mitjançant la col·laboració i les sinergies amb les universitats i les institucions de recerca de Catalunya, amb l'objectiu de mantenir-se com un referent científic internacional en aquest àmbit.

El CRM és un centre amb implantació interuniversitària en el sentit que de la seva activitat se'n beneficia el conjunt de la recerca en matemàtiques del país. La política científica del CRM per a l'assoliment de la seva missió té dos eixos d'acтуació:

- Donar suport als grups d'investigació, organitzant tipus d'activitats que depassen la capacitat dels mateixos, amb projecció internacional i acollint visitants amb qui treballen conjuntament.
- Des d'un punt de vista més proactiu, dissenyar i executar polítiques estratègiques que incideixin en debilitats de la recerca matemàtica a Catalunya entesa globalment, com són el Programa IAE d'incentivació d'àrees estratègiques i el pla de creació d'un cos propi i estable d'investigadors d'excellència.

1.1. Mission and Objectives

As stated in its statutes, the CRM's aim is to foster research and advanced training in mathematics, by collaborating with the universities and research institutions in Catalonia, in order to continue to be an international reference center.

The CRM is transversal in the sense that its activities benefit the whole community of mathematical researchers of our country. The scientific policy of the CRM towards fulfilling its mission is structured around two main axes:

- *To give support to research groups, by organising activities whose size or nature goes beyond the capabilities of the teams, achieving broad visibility and hosting visitors for joint work.*
- *To design and execute strategies aimed at repairing weaknesses of the mathematical research activity in Catalonia as a whole, such as the Strategic Areas Incentive Programme and the creation of a permanent staff of high-level CRM researchers.*

1.2. Estructura jurídica

El CRM va ser creat l'any 1984 per l'Institut d'Estudis Catalans (IEC) com a centre de recerca propi. El mateix any, l'IEC signà un conveni de col·laboració amb la Universitat Autònoma de Barcelona (UAB), en virtut del qual el Centre quedà ubicat físicament en uns espais d'aquesta universitat. L'any 1993 s'adequaren uns espais propis per al CRM a la Facultat de Ciències de la UAB amb finançament de la CIRIT. Per aquest motiu, es reformulà el conveni entre l'IEC i la UAB i se sol·licità l'adscripció del CRM a la UAB com a institut universitari.

L'accord del Govern de la Generalitat de 9 de juliol de 2002 (DOGC núm. 3693, de 6 d'agost de 2002) aprovà la constitució del Consorci Centre de Recerca Matemàtica, integrat per la Generalitat de Catalunya i l'IEC. El Consorci és una entitat pública amb personalitat jurídica pròpia.

El CRM està regit pel Consell de Direcció i pel Director, i compta amb un Consell Científic Assessor.

1.3. Consell de Direcció

El Consell de Direcció, òrgan superior de decisió i d'administració del CRM, està format per:

- El president, que és el conseller d'Innovació, Universitats i Empresa, o persona en qui delegui.
- El vicepresident, que és el president de l'IEC o persona en qui delegui.
- Tres vocals en representació de la Generalitat de Catalunya.
- Tres vocals en representació de l'IEC.
- El director del CRM, que hi participa amb veu però sense vot.

Fins a l'abril de 2009, la comissionada per a Universitats i Recerca, Blanca Palmada, va presidir el Consell per delegació del conseller, i a partir d'aquesta data ho va fer el comissionat Joan Majó. A més, la Generalitat de Catalunya hi

1.2. Legal Status

The CRM was founded in 1984 by the Institut d'Estudis Catalans (IEC), the Catalan Academy. In the same year, an agreement was signed with the Universitat Autònoma de Barcelona (UAB), by virtue of which the CRM became established in the UAB Campus. In 1993 the CRM inaugurated its own premises at the UAB's Science Faculty, thanks to financial support from CIRIT. On that occasion, the CRM became associated with the UAB as one of its research institutes.

The Government of Catalonia approved on July 9, 2002 (DOGC no. 3693, August 6, 2002) the creation of the CRM Consortium, formed by the Government and the IEC. The CRM Consortium is a public body with its own legal status.

The CRM is conducted by its Governing Board and the Director, and has a Scientific Advisory Board.

1.3. Governing Board

The Governing Board is the steering body of the CRM. Its members are the following:

- The Minister of Innovation, Universities and Enterprise of the Catalan Government, or a delegated person, acting as Chair.*
- The IEC President or a delegated person, acting as Vice Chair.*
- Three representatives of the Catalan Government.*
- Three representatives of the IEC.*
- The CRM Director, without vote.*

Until April 2009, the Commissioner for Universities and Research, Blanca Palmada, presided over the Board by delegation of the Minister. After this date, the Board was presided over by the new Commissioner, Joan Majó. The

va estar representada fins a l'abril de 2009 pel director general de Recerca, Ramon Moreno, la subdirectora general de Recerca, Iolanda Font de Rubinat, i el director de la CIRIT, Joan Roca. A partir de l'abril, Joan Roca va seguir formant-ne part com a director general de Recerca i Ramon Moreno com a director de la Fundació i-CERCA. L'Institut d'Estudis Catalans hi va estar representat tot l'any pel seu vicepresident, Salvador Alegret, el secretari científic, Ricard Guerrero, i per Joan Girbau.

El Consell de Direcció es va reunir el 26 de març, el 14 d'octubre i el 16 de desembre de 2009.



1.4. Equip de Direcció

El director del CRM és nomenat pel Consell de Direcció, a proposta del president, per a un període de quatre anys. El director actual és Joaquim Bruna, que va ser nomenat per al període d'abril de 2007 a abril de 2011.

A proposta del director, el Consell de Direcció va nomenar el 2007 un equip format per Carles Casacuberta, Marta Sanz-Solé i Joan Solà-Morales. Aquest equip assessorà i ajuda el director en les tasques de direcció del Centre.

Manuel Castellet, que va ser fundador del CRM i director des de la creació del Centre l'any 1984, va ser nomenat director honorari pel Consell de Direcció l'any 2007.

Catalan Government was also represented until April 2009 by the General Director of Research, Ramon Moreno, the Vice Director of Research, Iolanda Font de Rubinat, and the Director of CIRIT, Joan Roca. Since April 2009, Joan Roca remained in the Board as General Director of Research and Ramon Moreno remained in the Board as Director of i-CERCA. The IEC was represented in 2009 by its Vice President, Salvador Alegret, its Scientific Secretary, Ricard Guerrero, and by Joan Girbau.

The Governing Board met on March 26, October 14 and December 16, 2009.



1.4. Team of Directors

The Governing Board elects a Director, proposed by the Chair, to serve for a period of four years. The current Director is Joaquim Bruna, who was elected for the period from April 2007 to April 2011.

On the Director's proposal, in 2007 the Governing Board also nominated a team consisting of Carles Casacuberta, Marta Sanz-Solé and Joan Solà-Morales, whose goal is to advise and assist the Director in the management of the Centre.

Manuel Castellet, who founded the Centre and had been CRM Director since its creation in 1984, was nominated Honorary Director by the Governing Board at its 2007 meeting.



1.5. Consell Científic Assessor

El Consell Científic Assessor està integrat per personalitats de prestigi científic en l'àmbit d'actuació del Centre, nomenats pel Consell de Direcció a proposta del director, el qual n'ostenta la presidència. La llista de membres del Consell Científic Assessor s'especifica a continuació.

El Consell Científic Assesor es va reunir el 28 d'abril de 2009 amb els punts següents a l'ordre del dia: memòria anual de 2008; activitats del curs acadèmic 2008-2009; activitats previstes per a 2009-2010; evaluació de les activitats proposades per a 2010-2011; places de personal investigador propi del Centre; investigadors visitants; col·laboracions bilaterals; perspectives del Centre a curt i llarg termini.

1.5. Scientific Advisory Board

The CRM's Scientific Advisory Board is formed by outstanding mathematicians, nominated by the Governing Board on the Director's proposal, and chaired by the Director. The current list of members of the Scientific Advisory Board is given below.

The Scientific Advisory Board met on April 28, 2009, with the following agenda: 2008 report of activities; programme of activities for 2008-2009; expected activities in 2009-2010; evaluation of proposals for 2010-2011; new research positions; visitors; bilateral agreements; mid-term and long-term perspectives of the Centre.

Jaume Aguadé, Universitat Autònoma de Barcelona

Alfredo Bermúdez de Castro, Universidade de Santiago de Compostela

Michel Boileau, Université de Toulouse

Aline Bonami, Université d'Orléans

Bodil Branner, Danmarks Tekniske Universitet, Lyngby

Luis Caffarelli, University of Texas at Austin

Eduard Casas-Alvero, Universitat de Barcelona

José Luis Fernández, Universidad Autónoma de Madrid and AFI

Gerhard Frey, Institut für Experimentelle Mathematik, Essen

Oscar García Prada, CSIC, Madrid

Antonio Huerta, Universitat Politècnica de Catalunya, Barcelona

Andreu Mas-Colell, Universitat Pompeu Fabra, Barcelona (until April 2009)

Dominique Picard, Université Paris VII

Kristian Seip, Norges Teknisk-Naturvitenskapelige Universitet, Trondheim

Maria Eulalia Vares, Centro Brasileiro de Pesquisas Físicas, Rio de Janeiro

Dominic Welsh, University of Oxford



1.6. Personal investigador

El CRM, des de la seva fundació i fins a 2007, no havia tingut personal investigador propi estable, sinó que el seu personal investigador estava format només pels visitants (locals o forans) i pels becaris postdoctorals que participaven en els programes de recerca o en altres activitats. Una gran part de l'activitat del CRM es recolza científicament en el personal investigador de les universitats catalanes. Tot i això, el CRM no basa aquesta col·laboració en la figura del professorat adscrit. El CRM, per tant, tampoc no té personal adscrit universitari.

El pla estratègic del CRM per al període 2008-2013 preveu la formació d'una plantilla pròpia d'investigadors contractats. La primera incorporació amb aquest perfil es va produir l'any 2007. El nombre d'investigadors que de mitjana es troben al CRM és actualment de 38 persones en cada moment, comptant-hi els visitants.

1.6. Research Staff

Until 2007, the only CRM researchers were visitors (local or foreign) and postdoctoral fellows participating in research programmes or in other activities. A large amount of CRM activities rely on initiatives from research teams of Catalan universities. This collaboration is however not based on any changes of affiliation, and therefore the CRM does not have adscribed personnel from the universities in its staff.

The CRM's strategic plan for 2008-2013 includes the appointment of research staff through long-term contracts. The first contract was signed in 2007. The average number of researchers currently hosted by the CRM is 38 people simultaneously, including visitors.

1.6.1. Investigadors estables

Álvaro Corral
Des de desembre de 2007
Tema de recerca:
Anàlisi i modelització de sistemes complexos

Sebastian del Baño Rollin
De setembre de 2008 a agost de 2009
Tema de recerca:
Matemàtica financera

Sergey Tikhonov (CRM-ICREA)
Des d'octubre de 2008
Tema de recerca:
Anàlisi harmònica i teoria d'aproximacions

Timothy Myers
Des de desembre de 2009
Tema de recerca:
Modelització de processos industrials

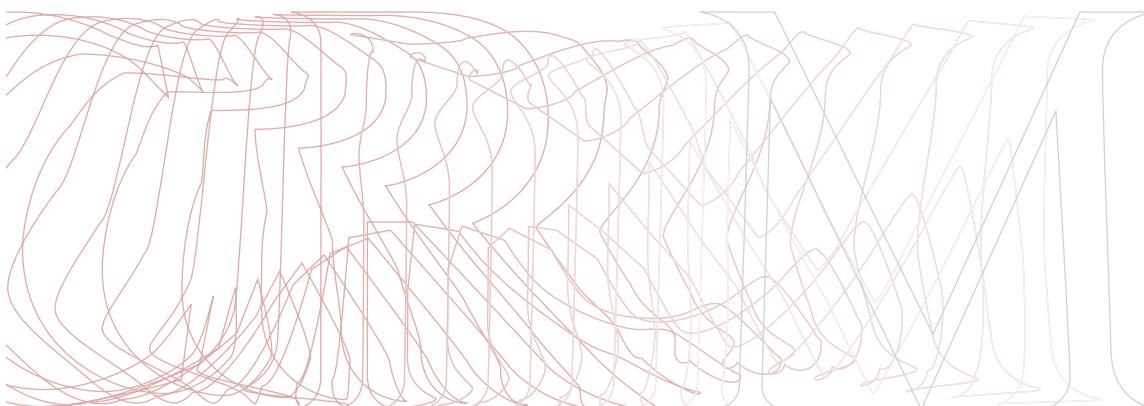
1.6.1. Long-term Researchers

Álvaro Corral
Since December 2007
Research topic:
Analysis and modeling of complex systems

Sebastian del Baño Rollin
From September 2008 to August 2009
Research topic:
Mathematical finance

Sergey Tikhonov (CRM-ICREA)
Since October 2008
Research topic:
Harmonic analysis and approximation theory

Timothy Myers
Since December 2009
Research topic:
Modelisation of industrial processes



1.6.2. Investigadors postdoctorals

El CRM acull investigadors postdoctorals amb fonts de finançament diverses: beques Marie Curie de la Comissió Europea, programa d'ajudes de recerca per a estades de doctors joves del Ministeri de Ciència i Innovació (MICINN), beques Beatriu de Pinós de la Generalitat de Catalunya, beques de l'EPDI (vegeu 1.15), beques de la Fundació John Templeton (associades a un projecte de recerca de 2009 a 2011; vegeu 2.3.4) i beques pròpies del CRM.

Normalment aquestes beques tenen una durada d'entre un i dos anys. El llistat d'investigadors postdoctorals que varen treballar al CRM durant l'any 2009 es detalla a continuació.

Cécile Armana (EPDI)
Since September 2009

Pierre Berger (EPDI)
September 2008 to February 2009

José María Cantarero (CRM)
Since September 2009

L. Houssain El Fadil (MICINN)
November 2007 to April 2009

Vincent Feuvrier (CRM)
Since September 2009

Javier Gutiérrez (Beatriu de Pinós)
September 2007 to August 2009

Gemma Huguet (CRM and i-MATH)
Since September 2008

Martin Koerwien (CRM)
Since September 2009

1.6.2. Post-doctoral Researchers

The CRM hosts post-doctoral fellows from several financing sources: Marie Curie Fellowships of the European Commission, research grants for young doctors of the Spanish Ministry of Science and Innovation (MICINN), Beatriu de Pinós Fellowships of the Catalan Government, EPDI Fellowships (see 1.15), grants from the John Templeton Foundation (associated with a 2009-2011 research project; see 2.3.4), and CRM's own post-doctoral grants.

Typically these grants have a duration of between one and two years. The list of post-doctoral researchers working at the CRM in 2009 is the following.

Francesco Matucci (CRM)
September 2008 to August 2009

Dieter Mitsche (Beatriu de Pinós)
Since September 2009

Moritz Müller (CRM)
Since September 2009

Salvador Ortiz (CRM and i-MATH)
Since October 2009

Radu Saghin (MICINN)
September 2007 to February 2009

Radu Saghin (Marie Curie)
Since September 2009

Graham Smith (CRM)
October 2008 to September 2009

Edgar Tchoundja (CRM)
Since September 2009

1.6.3. Investigadors predoctorals

El CRM també atorga beques predoctorals, destinades a la realització de tesis doctorals a les universitats catalanes en les especialitats específiques en el Programa IAE d'incentivació d'àrees estratègiques del Centre (vegeu 1.13).

El llistat de becaris predoctorals finançats o cofinançats pel CRM durant l'any 2009 es detalla a continuació.

Lidia Almazán (CRM-UAB and i-MATH)

Since September 2009

Topic: Hydrodynamical Modelling

Advisor: José A. Carrillo, Universitat Autònoma de Barcelona

Ana Deluca

Since September 2009

Topic: Complex Systems

Advisor: Álvaro Corral, Centre de Recerca Matemàtica

Albert Ferreiro (CRM-UAB)

Since June 2007

Topic: Mathematical Finance

Advisor: Frederic Utzet, Universitat Autònoma de Barcelona

Pedro Ernesto García Rodríguez (CRM-UPF)

Since February 2007

Topic: Mathematical Neuroscience

Advisor: Gustavo Deco, Universitat Pompeu Fabra

Somayeh Heidarvand (CRM-UPC)

Since September 2007

Topic: Digital Content Security

Advisor: Jorge Luis Villar, Universitat Politècnica de Catalunya

Maite Naranjo

Since October 2009

Topic: Mathematical Finance

Advisor: Marta Sanz-Solé, Universitat de Barcelona

Juan José Rivaud (CRM-UAB and i-MATH)

Since September 2009

Topic: Biomathematics

Advisor: Àngel Calsina, Universitat Autònoma de Barcelona

1.6.3. Doctoral Researchers

The CRM also awards doctoral grants for PhD theses at Catalan universities on topics specified in the CRM's Strategic Areas Incentive Programme (see 1.13).

The list of doctoral researchers financed or co-financed by the CRM in 2009 is the following.

1.7. Administració

1.7.1. Gerent

El Sr. Oriol Fernández ocupa el càrrec de gerent des de desembre de 2008.

ofernandez@crm.cat Tel: 93 586 8424

1.7.2. Equip de secretaria

L'equip de secretaria del CRM s'ocupa d'organitzar els aspectes logístics de les activitats científiques i de vetllar perquè els investigadors puguin dur a terme estades fructíferes i sense entrebancs.

Les persones següents varen formar l'equip de secretaria del CRM l'any 2009. El Sr. Moisès Oliver es va incorporar el mes de juny de 2009 i la Sra. Raquel Hernández el mes d'octubre.

1.7. Administration

1.7.1. Manager

The CRM's Manager is Mr. Oriol Fernández since December 2008.

ofernandez@crm.cat Tel: 93 586 8424

1.7.2. Secretarial Team

The CRM Secretarial Team is responsible for logistics organisation of scientific activities and provides an environment for fruitful and troubleless working conditions.

The following people made up the team. Mr. Moisès Oliver started working in June 2009 and Mrs. Raquel Hernández started in October 2009.



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1.8. Equipament

Els espais que actualment ocupa el CRM estan situats en una ala de l'edifici de la Facultat de Ciències de la UAB, amb una superfície total de 1.225 m², que permeten la ubicació de la secretaria, la direcció, un màxim de 30 investigadors i dues aules amb capacitat per a 30 i 100 persones.

El mes de juliol de 2009 es van iniciar obres d'ampliació del Centre amb cofinançament FEDER i el suport del DIUE de la Generalitat de Catalunya, que un cop acabades incrementaran la superfície total del CRM en 900 m².

Per a l'allotjament dels investigadors visitants, el CRM té llogats en règim permanent 16 apartaments a la Vila Universitària de Bellaterra, a Sant Cugat i a Barcelona ciutat. Per a l'organització d'activitats puntuals com congressos i cursos avançats, el CRM lloga estudis a la Vila Universitària.

Durant l'any 2009, l'equipament informàtic del CRM constava d'una xarxa LAN Ethernet de 1.000/100 Mbps. A la xarxa hi ha connectades

1.8. Equipment

The CRM has facilities in the UAB Faculty of Sciences with a total floor space of 1,225 m², including secretarial offices, the Directors's desk, up to 30 researcher places, an auditorium with capacity for 100 people, and a lecture room for 30 people.

In July 2009, construction work began for the enlargement of the CRM's premises. Once completed, the Centre will gain 900 m². This work is supported by the FEDER programme of the European Union and the Catalan Government.

The CRM also has a few rented furnished apartments for the use of its visitors in Sant Cugat del Vallès (a town connected by train to the UAB campus and to Barcelona), in Barcelona, and in the Vila Universitària of the UAB campus. During activities such as conferences or advanced courses, the CRM rents additional apartments at the Vila Universitària.

During 2009, the CRM computer equipment was based on a LAN Ethernet net of 1,000/100 Mbps. There were 60 working stations connec-



60 estacions de treball i cinc impressores. Totes les estacions formen part d'un domini Windows controlat des de dos servidors Dell, un dels quals fa, a més, tasques de servidor de correu electrònic. Aquesta xarxa LAN és connectada a Internet a través de la xarxa de la UAB mitjançant un enllaç de 1.000 Mbps, amb un SonicWall que actua com a encaminador i tallafocs. El centre disposa també de connexió a Internet sense cables i de tres canons de projecció, dos dels quals estan instal·lats a les aules.

ted to the net, together with five printers. All workstations are part of a Windows domain supplied by two Dell servers, one of which works as a mail server. This LAN net is connected to Internet through the UAB net by means of a 1,000 Mbps connection, with a SonicWall acting as a router and firewall. Wi-fi connection is also available. The Centre has three projectors, two of them installed in the lecture rooms.

1.9. Serveis externs

El CRM té contractats els serveis de les empreses externes següents:

Computer technical service: GetPut Software S.L. (until August 2009)

Data base management: Àgil Grup

Labour management: 3F Consultors

1.9. External Services

The following companies had service contracts with the CRM in 2009:

1.10. Contracte programa

El primer contracte programa del CRM amb la Generalitat de Catalunya es va signar el 18 de juny de 2003. Es va mantenir vigent fins a 2006 i es va prorrogar durant l'any 2007. El 14 de febrer de 2009 s'ha signat un segon contracte programa que cobreix el període de 2008 a 2013.

Aquest contracte programa emana del pla estratègic del Centre, que va ser aprovat pel Consell de Direcció, i és la concreció dels eixos de desplegament continguts en el pla. Els objectius del contracte programa són: establir un nou marc de relacions i mecanismes de coordinació entre la Generalitat de Catalunya i el CRM; dotar el CRM dels mitjans necessaris per seguir complint els seus objectius; determinar la participació de la Generalitat de Catalunya en la definició i la programació dels objectius i del finançament del CRM; i configurar-se com un instrument de planificació estratègica, de gestió de la recerca, la formació, la difusió del coneixement i la millora de la qualitat.

1.10. Contract Programme

The first contract programme of the CRM with the Catalan Government was signed on June 18, 2003. It remained into force until 2006 and was extended over 2007. On February 14, 2009, a new contract programme was signed for the period 2008-2013.

This contract programme stems from the CRM's strategic plan, which was approved by the Governing Board, and specifies the main axes of the strategic plan. The goals of the contract programme are the following: to set up a new framework for relations and coordination mechanisms with the Catalan Government; to provide the CRM with the necessary resources to achieve its foundational aims; to specify the participation of the Catalan Government in the definition of the CRM's goals and financing; and to become an instrument for strategic planning, management of research, training, knowledge dissemination, and quality improvement.

El desenvolupament del contracte programa s'analitzà en una reunió anual d'una comissió mixta de seguiment. La reunió d'enguany es va fer el 26 de maig de 2009. Van participar-hi Joan Solà-Morales (en representació de l'equip de direcció del CRM) i Oriol Fernández (gerent), així com Iolanda Font de Rubinat (subdirectora general de Recerca), Agustina Guiteras (cap del servei d'Estructures de Recerca) i Ramon Noguera (director de projectes del CERCA). La Comissió va acordar que el grau d'assoliment dels objectius del contracte programa corresponents a l'any 2008 va ser del 93%.

The development of the contract programme is analysed and discussed in an annual meeting of a Monitoring Commission. In 2009 the meeting took place on May 26, with the participation of Joan Solà-Morales as a representative of the CRM's Team of Directors and Oriol Fernández as CRM Manager, together with Iolanda Font de Rubinat (Vice Director of Research), Agustina Guiteras (Head of the Service for Research Structures) and Ramon Noguera (Project Director of CERCA). The Commission declared that the goals stated in the contract programme had been achieved up to 93% in 2008.

1.11. Convocatòries internacionals

El CRM manté permanentment obertes diverses convocatòries al seu web:

- Estades de recerca al Centre
- Estades de recerca en col·laboració (*research in pairs*)
- Organització de congressos i *workshops*
- Organització de cursos d'estiu/hivern
- Organització de jornades temàtiques

D'altres convocatòries s'obren només durant períodes concrets:

- Programes de recerca
- Places de personal investigador sènior
- Places Lluís Santaló per a visitants d'Amèrica Llatina
- Beques postdoctorals (EPDI, Marie Curie i beques pròpies)
- Beques de doctorat en àrees estratègiques
- Beques per a treballs de recerca de final de màster o similars

1.11. International Calls

The CRM keeps several calls open in its website:

- Visiting the CRM
- Research in pairs
- Organisation of conferences and workshops
- Organisation of summer/winter courses
- Organisation of thematic days

Other calls are only open in specific periods:

- Research programmes
- Senior research positions
- Lluís Santaló positions for Latin American visitors
- Post-doctoral grants (EPDI, Marie Curie, CRM)
- Doctoral grants for work in strategic areas
- Grants for master's or similar projects

1.12. Ingenio Mathematica

El CRM és un dels promotores i un node d'un projecte anomenat Ingenio Mathematica, finançat pel Ministeri de Ciència i Innovació durant cinc anys dins del programa Consolider-Ingenio 2010. La data d'inici d'aquest projecte va ser el 3 d'octubre de 2006 i finalitzarà el 3 d'octubre de 2011.

L'investigador coordinador del projecte és Marco Antonio López Cerdá, de la Universitat d'Alacant, i l'entitat gestora és la Universitat de Cantàbria. La direcció científica del projecte correspon a un consell de direcció format per investigadors de diverses institucions de l'estat espanyol. Els nodes del projecte són: CRM, CESGA (Centro de Supercomputación de Galicia), CIEM (Centro Internacional de Encuentros Matemáticos, Castro Urdiales), ICMAT (Instituto de Ciencias Matemáticas, Madrid) i IMUB (Institut de Matemàtiques de la Universitat de Barcelona). Les activitats del projecte s'emmarquen en diverses plataformes, anomenades *Future*, *Consulting*, *Computing*, *EDU*, *PMII*, *SARE*, *SAIRT* i *MIGS*.

Moltes de les activitats del CRM desenvolupades durant l'any 2009 (programes de recerca, congressos, cursos avançats, etc.) varen ser finançades parcialment per Ingenio Mathematica.

1.12. Ingenio Mathematica

The CRM is one of the promoters, and a node, of a project called Ingenio Mathematica, which is being funded by the Spanish Ministry of Science and Innovation for five years, from October 3, 2006 to October 3, 2011, within the Ministry's Consolider-Ingenio 2010 programme.

The coordinator of the project is Marco Antonio López Cerdá, from Universitat d'Alacant, and the management center is located at Universidad de Cantabria. The scientific direction of the project lies under the responsibility of a Board of Directors formed by researchers from several Spanish institutions. The nodes of the project are: CRM, CESGA (Centro de Supercomputación de Galicia), CIEM (Centro Internacional de Encuentros Matemáticos, Castro Urdiales), ICMAT (Instituto de Ciencias Matemáticas, Madrid), and IMUB (Institut de Matemàtiques de la Universitat de Barcelona). Several platforms, named Future, Consulting, Computing, EDU, PMII, SARE, SAIRT, and MIGS, provide a framework for the actions of Ingenio Mathematica.

Many CRM activities, including research programmes, conferences, advanced courses, etc., were partially funded by Ingenio Mathematica in 2009.



1.13. Programa d'incentivació d'àrees estratègiques

El seguiment de les possibles àrees emergents de la matemàtica i les seves aplicacions és un objectiu prioritari per al CRM, així com l'aportació d'incentius i de recursos per tal que els investigadors en àrees tradicionals o els més joves s'hi puguin incorporar. Per aquest motiu, el CRM impulsa el programa IAE d'incentivació d'àrees estratègiques des de 2007, com a continuació de diverses iniciatives d'anys anteriors i amb el propòsit de fomentar la investigació multidisciplinària en àrees considerades interessants i importants en aquests moments.

Com a continuació de l'estratègia iniciada amb el projecte europeu MATHFSS, que es va desenvolupar entre els anys 2005 i 2008, el CRM s'ha compromès a donar suport a quatre temes específics: la matemàtica industrial, la matemàtica finançera, els sistemes complexos i la biomatemàtica.

L'acció més destacada que s'ha fet en aquest terreny durant l'any 2009 ha estat la contractació del Dr. Timothy Myers el desembre de 2009, previ concurs obert internacional, per a liderar la línia de matemàtica industrial al Centre. Aquest equip de recerca creixerà a partir del febrer de 2010 amb la incorporació d'un investigador predoctoral i un investigador postdoctoral a través d'una crida competitiva.

L'octubre de 2009, el CRM va obrir un concurs internacional per a la incorporació d'un investigador sénior en biomatemàtica.

Les altres accions que està fent el CRM dins del programa IAE són dels tipus següents:

- Organització de workshops, seminaris i cursos.
- Ajuts als grups que treballen en àrees estratègiques.
- Suport a la creació i desenvolupament de nous grups de qualitat en aquestes àrees, dedicant-hi beques i altres recursos.

Concretament, durant l'any 2009, el CRM ha

1.13. Strategic Areas Incentive Programme

The monitoring of possible emerging areas in mathematics and their applications, as well as the contribution of incentives and resources so that researchers in traditional areas or younger researchers can join these emerging sectors, must be a high priority objective for a mathematical research centre. This is how the CRM views its Strategic Areas Incentive Programme (IAE), which is currently being planned for the coming years.

As a continuation of the strategy initiated with the MATHFSS project (Shaping New Directions in Mathematics for Science and Society), which was developed between 2005 and 2008 with European funding, the CRM has declared its commitment to support Industrial Mathematics, Financial Mathematics, Complex Systems, and Biomathematics.

The main action made in 2009 was the hiring of Dr. Timothy Myers in December after an international competition. He is leading a team in Industrial Mathematics that will grow in February 2010 by incorporating a doctoral researcher and a post-doctoral researcher through open calls.

In October 2009, the CRM launched an international call for a senior position in Biomathematics.

Other actions undertaken by the CRM within the IAE programme include the following:

- Organisation of events such as workshops, seminars, and courses.
- Support for local groups working in these areas.
- Participation in the creation and development of new quality groups in these areas, by allocating resources (doctorate scholarships and post-doctoral grants) as in recent years.

Specifically, the following activities were organised by the CRM in 2009. More information about these is given in the activities section.

- Mathematics and Technology Study Groups (GEMT 2009).

organitzat les activitats següents en el marc del programa IAE. Hi ha més informació sobre elles a la secció d'activitats.

- Grups d'Estudi de Matemàtica i Tecnologia (GEMT 2009).
- *Jornada Interconsolider Matemàtiques-Nanociència.*
- *Barcelona Financial Engineering Summer School*, a la Borsa de Barcelona.
- *Seminar Cycle on Computational and Systems Neuroscience*, tot l'any.

El CRM va obrir el 2008 una convocatòria destinada a incentivar treballs de màster en àrees emergents, que ha continuat el 2009 amb dos ajuts atorgats a Olivier Valero i Emiliano Sánchez. El juliol de 2009 va acabar el seu treball Sundus Zafar, de la convocatòria anterior (tutoritzat per Àngel Calsina), i el desembre de 2009 va fer-ho Francesc Font (amb la tutoria d'Àlvaro Corral).

1.14. ERCOM

ERCOM és l'acrònim del comitè *European Research Centres on Mathematics* de la Societat Matemàtica Europea (EMS), format pels directors científics de diversos centres de recerca europeus. Els centres representats a ERCOM són aquells el nombre de visitants dels quals supera essencialment el nombre d'investigadors permanents o de llarga durada i que cobreixen un espectre ampli de les matemàtiques. El CRM és membre d'ERCOM des de la seva fundació l'any 1997.

El president d'ERCOM és nomenat per un període de quatre anys pel comitè executiu de l'EMS. De 2006 a 2009, ERCOM va ser presidit per Jan Karel Lenstra, director del Centrum voor Wiskunde en Informatica d'Amsterdam. A finals de l'any 2009 va ser escollit president Gert-Martin Greuel, director del Mathematisches Forschungsinstitut Oberwolfach.

La reunió anual d'ERCOM de 2009 tingué lloc els dies 13 i 14 de març a l'Institut Mittag-Leffler de Djursholm (Estocolm).

- *Mathematics-Nanoscience Interconsolider Meeting.*
- *Barcelona Financial Engineering Summer School*, at Borsa de Barcelona.
- *Seminar Cycle on Computational and Systems Neuroscience*

The CRM launched a call in 2008 to promote research in emerging areas at master's level. This action has continued in 2009 with two grants awarded to Olivier Valero and Emiliano Sánchez. Sundus Zafar, from the previous year, completed his work in July 2009 under the direction of Àngel Calsina. In December 2009, Francesc Font completed his work advised by Àlvaro Corral.

1.14. ERCOM

ERCOM is the acronym of the European Research Centres on Mathematics committee of the European Mathematical Society (EMS), consisting of the scientific directors of European research centres in the mathematical sciences. Only centres for which the number of visiting staff substantially exceeds the number of permanent and long-term staff, and which cover mathematical sciences broadly, are eligible for representation in ERCOM. The CRM has been a member of ERCOM since the committee's creation in 1997.

The Chairman of ERCOM is appointed for a period of four years by the EMS Executive Committee. From 2006 to 2009, ERCOM has been chaired by Jan Karel Lenstra, director of the Centrum voor Wiskunde en Informatica, Amsterdam. A new chair, Gert-Martin Greuel, director of the Mathematisches Forschungsinstitut Oberwolfach, was elected in 2009.

The annual meeting of ERCOM took place at the Mittag-Leffler Institute (Djursholm, Stockholm) on March 13 and 14, 2009.

For more information: www.ercom.org

1.15. Beques EPDI

Des de desembre de 2000, el CRM és membre de l'EPDI (*European Post-Doctoral Institute for the Mathematical Sciences*), que agrupa deu prestigiosos instituts d'investigació europeus: Institut des Hautes Études Scientifiques, Bures-sur-Yvette (el director del qual n'és el coordinador); Max-Planck-Institut für Mathematik, Bonn; Isaac Newton Institute for the Mathematical Sciences, Cambridge; Max-Planck-Institut für Mathematik in den Naturwissenschaften, Leipzig; Institute Mittag-Leffler, Djursholm; Banach Center, Varsòvia; Erwin Schrödinger Institut, Vienna; Forschungsinstitut für Mathematik, Zuric; Mathematisches Forschungsinstitut Oberwolfach; Centre de Recerca Matemàtica, Bellaterra.

L'EPDI convoca anualment beques postdoctorals de dos anys de durada en l'àmbit de les matemàtiques i de la física matemàtica, ofertes a joves investigadors de països europeus.

A la crida de 2008 es va seleccionar Pierre Berger, que va ser al CRM de setembre de 2008 a febrer de 2009. A la crida de 2009 es va escollir Cécile Armana, que es va incorporar al CRM el setembre de 2009 i hi serà fins a l'agost de 2010.

1.15. EPDI Fellowships

Since December 2000, the CRM has been a member of the EPDI (*European Post-Doctoral Institute for the Mathematical Sciences*), which currently groups ten European research institutes: the Institut des Hautes Études Scientifiques (IHÉS) in Bures-sur-Yvette (the Director of which is the coordinator), the Max-Planck-Institut für Mathematik in Bonn, the Isaac Newton Institute for the Mathematical Sciences in Cambridge, the Max-Planck-Institut für Mathematik in den Naturwissenschaften in Leipzig, the Institute Mittag-Leffler in Djursholm, the Banach Center in Warsaw, the Erwin Schrödinger Institut in Vienna, the Forschungsinstitut für Mathematik (FIM) in Zürich, the Mathematisches Forschungsinstitut Oberwolfach, and the CRM.

The EPDI annually awards post-doctoral grants in mathematics (pure and applied) and mathematical physics, which are offered to young researchers in European countries.

Pierre Berger was selected in the 2008 call for a stay at the CRM from September 2008 to February 2009. In 2009, Cécile Armana was selected for a stay at the CRM from September 2009 to August 2010.

For more information: seven.ihes.fr/EPDI/index.html



2

2.1. Actes de commemoració dels 25 anys del CRM

El 2009 el CRM va complir 25 anys. Es van organitzar dos actes per a commemorar aquesta efe-mèride. El 27 d'abril de 2009 es va fer un acte a L'Auditori de Barcelona adreçat a tota la comunitat matemàtica catalana, amb la presència del president de la Generalitat de Catalunya, al qual assistiren unes 300 persones. L'acte consistí en un concert de piano a càrrec d'Alexander Melnikov, precedit d'uns parlaments institucionals a càrrec de la comissionada per a Universitats i Recerca, Sra. Blanca Palmada, el director general de Recerca, Sr. Ramon Moreno, el director del CRM, Sr. Joaquim Bruna, i el Molt Honorable President de la Generalitat, Sr. José Montilla.

El 27 de novembre de 2009 s'organitzà un acte de commemoració de caire més acadèmic a l'IEC, amb el títol CRM Open Day 2009. Es van programar conferències a càrrec de matemàtics molt prestigiosos:

2.1. Celebration of the CRM's 25th Anniversary

The CRM celebrated its 25th anniversary in 2009. Two events were organised with this purpose. On April 27, 2009, an institutional ceremony took place at L'Auditori de Barcelona under the presidency of the President of the Catalan Government. This ceremony was attended by 300 people. It consisted of a piano concert by Alexander Melnikov and speeches by the Commissioner for Universities and Research, Blanca Palmada, the General Director of Research, Ramon Moreno, the CRM Director, Joaquim Bruna, and the President of the Catalan Government, José Montilla.

On November 27, 2009, a scientific meeting took place at the IEC under the name 2009 CRM Open Day. Talks were given by the following renowned mathematicians:

Noga Alon, Tel Aviv University

Graph eigenvalues and the interplay between discrete and continuous isoperimetric problems

Jean-François Le Gall, Université Paris-Sud, Orsay
The continuous limit of large random planar maps

Maxim Kontsevich, Institut des Hautes Études Scientifiques
Holomorphicity in quantum field theory

Mario Primicerio, Università di Firenze
A simple example of industrial mathematics: modelling the flow of heavy oils

L'acte també inclogué una cerimònia institucional amb el títol *A glimpse into the CRM's trajectory* i una taula rodona anomenada *The CRM and the current role of mathematical research centres*, amb els ponents següents:

Jean-Pierre Bourguignon
Director of the Institut des Hautes Études Scientifiques (IHÉS)

Joaquim Bruna
Director of the Centre de Recerca Matemàtica (CRM)

Nassif Ghoussoub
Scientific Director of the Banff International Research Station (BIRS)

Ari Laptev
President of the European Mathematical Society (EMS)

També s'organitzà una exposició sobre diferents aspectes de la trajectòria del CRM en aquests 25 anys, que es va exhibir a l'Institut d'Estudis Catalans del 27 de novembre al 10 de desembre de 2009 i que es pot veure permanentment en fitxers pdf a:

This event also included an institutional ceremony entitled A glimpse into the CRM's trajectory, and a round table entitled The CRM and the current role of mathematical research centres, with the following participants:

Finally, an exhibition was displayed from November 27 to December 10, 2009 at the IEC about many aspects of the CRM trajectory since its foundation in 1984. The content of this exhibition is stored in pdf format at:

www.crm.cat/General/Exposicio2009.htm



El President de la Generalitat de Catalunya,
José Montilla

*The President of the Catalan Government,
José Montilla*



D'esquerra a dreta:
From left to right:

Ramon Moreno,
Joaquim Bruna,
Blanca Palmada,
José Montilla,
Manuel Castellet



Participants a la taula rodona:
Round table panelists:

Joaquim Bruna,
Jean-Pierre Bourguignon,
Marta Sanz-Solé,
Ari Laptev,
Nassif Ghoussoub



Escoltant una conferència
Listening to a talk

2.2. Investigadors visitants

Diversos investigadors varen fer estades temporals al CRM durant l'any 2009, fins a una quantitat total de 462 mesos. La majoria d'aquests investigadors varen ser participants als programes de recerca i alguns d'ells varen ser invitats a través de les convocatòries públiques del CRM per a estades de visitants i estades de recerca en col·laboració.

El llistat de visitants de 2009 es detalla a continuació. Aquest llistat no inclou el personal investigador propi del CRM (investigadors sènior i becaris) ni els visitants que hagin fet estades inferiors a dues setmanes.

Judit Abardia	Universitat Autònoma de Barcelona
Tomás Alarcón	Imperial College, London
Begoña Alarcón	Universitat de València
Sara Arias de Reyna	Centre de Recerca Matemàtica
Kari Astala	University of Helsinki
Jonas Azzam	University of California at Los Angeles
Matthew Badger	University of Washington
Miguel Ángel Barja	Universitat Politècnica de Catalunya
Alex Bartel	University of Cambridge
José Manuel Benita	Universitat Politècnica de Catalunya
Lucio Renato Berrone	Instituto de Matemática Aplicada San Luis
Oleksandra Beznosova	University of Missouri
Nayantara Bhatnagar	The Hebrew University of Jerusalem
Dmitry Bilyk	Institute for Advanced Study
Matthew R. Bond	Michigan State University
Nicholas Boros	Michigan State University
Nicolas Brunel	Université Paris Descartes, Paris 5
José Ignacio Burgos	ICMAT, CSIC, Madrid
Vincent Calvez	École Normale Supérieure de Paris
Luca Capogna	University of Arkansas
Fabio A. C. C. Chalub	Universidade Nova de Lisboa
Vasileios Chousionis	University of Helsinki
Albert Compte	IDIBAPS – Hospital Clínic, Barcelona
Alberto Condori	Michigan State University
Lucilla Corrias	Université d'Évry Val d'Essonne
Marianna Csornyei	University College London
Paolo del Giudice	Istituto Superiore di Sanità, Roma
Amadeu Delshams	Universitat Politècnica de Catalunya
Anne Devys	INRIA Lille-Nord Europe Research Centre
Josep Díaz	Universitat Politècnica de Catalunya
Odo Diekmann	Universiteit Utrecht
Luis Dieulefait	Universitat de Barcelona
Tim Dokchitser	University of Cambridge

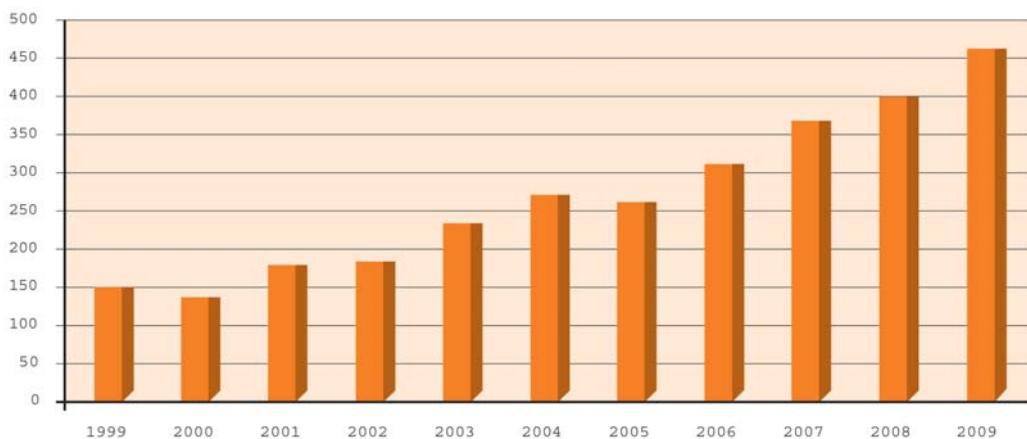
2.2. List of Visitors

The total number of visitor months at the Centre was 462 in 2009. Most of these visitors came as participants at CRM Research Programmes, and some of them were invited through CRM open calls for visiting researchers and research in pairs.

The list of 2009 visitors is the following. This list does not include CRM staff researchers nor visitors whose stay was shorter than two weeks.

Maria Rita D'Orsogna	California State University Northridge
Abderrahman Ebde	École Normale Supérieure de Paris
Blas Echebarria	Universitat Pompeu Fabra
Jozsef Farkas	University of Stirling
John B. Garnett	University of California at Los Angeles
José Manuel Gesto	Escola Universitària Tècnica Industrial de Barcelona
Philipp M. Getto	Basque Centre for Applied Mathematics
María José González	Universidad de Cádiz
Enrique González	Universidad Autónoma de Madrid
Loren Graham	Harvard University
Antonio Guedes	Universidade do Porto
Piotr Hajłasz	University of Pittsburgh
Rafael Herrera	Centro de Investigación en Matemáticas
Miguel Ángel Herrero	Universidad Complutense de Madrid
Mimmo Iannelli	Università di Trento
Tadeusz Iwaniec	Syracuse University
Jean-Michel Kantor	Université Paris Diderot, Paris 7
Markus Kirkilionis	University of Warwick
Lefteris M. Kirousis	University of Patras
Jair Koiller	Fundaçao Getulio Vargas, Rio de Janeiro
Pekka Koskela	Jyväskylä Universitet
Lucas Lacasa	Universidad Politécnica de Madrid
Michael Lacey	Georgia Institute of Technology
Loredana Lanzani	University of Arkansas
Joan Andreu Lázaro	Universidad de Zaragoza
José Tomás Lázaro	Universitat Politècnica de Catalunya
Elijah Liflyand	Bar-Ilan University
Gabriela Litcanu	Romanian Academy
Juan José López	Universidad Complutense de Madrid
Elitza Maneva	Universitat Politècnica de Catalunya
Conrado Martínez	Universitat Politècnica de Catalunya
Francisco Dardo Martínez	Instituto Argentino de Matemáticas
Jiří Matoušek	Univerzita Karlova
Svitlana Mayboroda	Purdue University
Colin McDiarmid	University of Oxford
Anton Mellit	National Technical University of Ukraine
Cristian Morales	Universidad de Sevilla
Evsey Morozov	Russian Academy of Sciences
Tobias Müller	CWI, Amsterdam
Ignasi Mundet	Universitat de Barcelona
Alan J. Murphy	Syracuse University
Marc Noy	Universitat Politècnica de Catalunya
Eulàlia Nualart	Université Paris 13, Nord
Yerlan Nursultanov	Lomonosov Moscow State University
Anthony O'Farrell	National University of Ireland
Jan Onninen	Syracuse University
Ariel Martin Pacetti	Universidad de Buenos Aires
Carlos Pérez	Universidad de Sevilla
Xavier Pérez	University of Waterloo

Ravi Ramakrishna	Cornell University
Diana Jorgelina Recchi	Universidad Nacional del Sur
María del Carmen Reguera	Georgia Institute of Technology
Steffen Rohde	University of Washington
Uwe Rösler	Universität Kiel
Víctor Rotger	Universitat Politècnica de Catalunya
Eero Saksman	University of Helsinki
Christian Schmeiser	Technische Universität Wien
Marco Adamo Seveso	Università di Milano
Pablo Sebastián Shmerkin	University of Manchester
Nicolás Martín Sirolli	Universidad de Buenos Aires
Leonid Slavin	University of Missouri
Marie Snipes	University of Michigan
Ignacio Sols	Universidad Complutense de Madrid
Wilfredo Sosa	Universidad Nacional de Ingeniería, Lima
Betsy Stovall	University of California at Berkeley
Louis Tao	Peking University
Nicolae Tecu	Yale University
David H. Terman	Ohio State University, Columbus
Andrew Tonks	London Metropolitan University
Joaquín Javier Torres	Universidad de Granada
Ariane Trescases	École Normale Supérieure de Cachan
Ciprian Tudor	Université Paris 1, Panthéon-Sorbonne
Eric Urban	Columbia University
Ignacio Uriarte	Michigan State University
Armen Vagharshakyan	Georgia Institute of Technology
Clàudia Valls	Instituto Superior Técnico, Lisboa
Stefano Vigni	Universitat Politècnica de Catalunya
Osamu Watanabe	Tokyo Institute of Technology
Brett D. Wick	University of South Carolina
Xiao Zhong	Jyväskylä Universitet
Francesco Zucconi	Università di Udine
Nguyen Tien Zung	Université de Toulouse III



Nombre de mesos d'investigadors visitants (*personal propi* exclòs) / Number of visitor months (staff not included)

2.3. Programes de recerca

Un programa de recerca del CRM consisteix en un període intensiu de recerca en una àrea determinada de les matemàtiques i les seves aplicacions, durant el qual s'apleguen al CRM investigadors procedents de diferents institucions per treballar en problemes oberts del seu àmbit d'especialització i per analitzar-ne l'estat i les perspectives.

Els programes de recerca del CRM poden durar normalment entre tres mesos i un curs acadèmic sencer. Cada programa té un comitè científic responsable de planificar les activitats inclòsses en el programa, elaborar la llista dels participants i lliurar un informe final. Típicament, en un programa hi participen investigadors locals a temps complet, investigadors visitants a temps complet (per a estades d'una durada mínima d'un mes), becaris postdoctorals i estudiants de doctorat avançats. Les activitats d'un programa inclouen generalment un o dos seminaris setmanals, un workshop intensiu (preferentment obert a investigadors que no participin en el programa), un congrés internacional i un curs avançat dirigit a estudiants de doctorat.

A continuació es descriuen els programes de recerca organitzats durant l'any 2009, corresponents als cursos 2008-2009 i 2009-2010.

2.3.1. Mathematical Biology: Modeling and Differential Equations

<i>Duration:</i>	January to June 2009
<i>Participants:</i>	108 person months
<i>Coordinators:</i>	Àngel Calsina, Universitat Autònoma de Barcelona José Antonio Carrillo, ICREA and Universitat Autònoma de Barcelona Antoni Guillamón, Universitat Politècnica de Catalunya

<i>Scientific Committee:</i>	Rafael Bravo, Universidad de Alcalá de Henares Àngel Calsina, Universitat Autònoma de Barcelona José Antonio Carrillo, ICREA and UAB (coordinator) Antoni Guillamón, Universitat Politècnica de Catalunya Benoît Perthame, ENS-Université Paris 6 Angela Stevens, Universität Heidelberg
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<i>Seminar Coordinator:</i>	Sílvia Cuadrado, Universitat Autònoma de Barcelona
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2.3. Research Programmes

The CRM Research Programmes consist of periods of intensive research in a given area of the mathematical sciences and their applications, bringing together researchers from different institutions to work on open problems in the chosen area and to analyse its present state and perspectives.

Research programmes can run for periods from three months to a whole academic year. Every programme should have a scientific committee, which is fully responsible for the planning of all activities included in the programme, the elaboration of the list of participants, and the submission of a final report. Typically, participants in a programme include local full-time researchers, visitors on a full-time basis (for stays of at least one month), post-doctoral fellows and advanced doctoral students. A research programme generally includes one or two weekly seminars, one intensive workshop (preferably open to researchers not participating in the programme), a conference and an advanced course addressed to graduate students.

The CRM Research Programmes that took place in 2009 are described below, corresponding to the academic years 2008-2009 and 2009-2010.

Summary:

Mathematical Biology is one of the fastest growing fields in the mathematical sciences nowadays. Due to the enormous number of possible applications and their important consequences for the society, they have received a great deal of attention from the applied mathematical community during the last years. Just to name a few applications, one can find interesting mathematics in protein folding, signalling in neurons, ionic channels, sensory-motor and cognitive processes, immunology, cell migration, angiogenesis, tumour growth, species evolution, epidemiology, ecology, fishery resources... and basically in any area of biology and medicine. One of the main techniques used in the modelling of these phenomena are differential equations which have been the main technical part of the program.

Modelling in biology faces new mathematical challenges due to the numerous spatial and temporal scales involved and the enormous different interactions between “individuals” with chemical, molecular, mechanical and electrical phenomena. An example of this complexity is the understanding of the behaviour of individual cells and populations: chemotaxis, cell movement, cell aggregation, cell behaviour in particular situations as angiogenesis, cell signalling in neurons, functional synaptic architectures... One of the main aspects of the program has been a contribution to understand how to incorporate individual behaviour (single cell models, microscopic modelling) giving rise to a description of their collective behaviour (ensemble behaviour, macroscopic modelling).

The events of this research program have focused, as we pointed out above, on the modelling through differential equations, the mathematical tools that appear most naturally in biology models since they are the basic language of expression of the different mechanisms taken into account. Ordinary differential systems, either deterministic or stochastic, form usually the bricks of the modelling from which more complicated phenomena can be analysed by means of partial differential equations. The qualitative properties obtained from the analytical study of these models can be a great deal of information for the modeller in order to assess the validity of the models and a way of improving the modelling. Numerical computation and simulation of the models can offer insights on the expected results and complement the information obtained from analytical tools. For instance, the workshop included in the program gathered together specialists on all these types of differential equations as well as different biological fields modelled through such equations.

Activities:

**Weekly Seminar on Mathematical Biology:
Modeling and Differential Equations**

Speakers:

Carles Perelló (UAB), Lucilla Corrias (Évry), María Victoria Sánchez-Vives (IDIBAPS), Philipp Getto (BCAM), Jozsef Z. Farkas (Stirling), Gabriela Litcanu (Romanian Academy), Yoshie Sugiyama (Tsuda College), Avner Friedman (Ohio State), Dirk Horstmann (Köln), Glenn Webb (Vanderbilt), Vincent Calvez (Paris), Paolo del Giudice (Roma), Gemma Huguet (CRM), R. H. Khonsari (Nantes), Pierre Magal (Le Havre), Klemens Fellner (Cambridge), Nicolas Brunel (Paris), Markus Kirkilionis (Warwick), Maria Rita D'Orsogna (California), Benoît Perthame (Paris), Judit Chamorro (Madrid).

**Advanced Course on Mathematical Biology:
Modeling and Differential Equations**

Dates: 2-6 February 2009

Participants: 78

Lecturers:	Odo Diekmann, Universiteit Utrecht <i>Physiologically structured population models and delay equations</i>
	Masayasu Mimura, Meiji University <i>Pattern formation and reaction-diffusion systems</i>
	Benoît Perthame, ENS-Université Paris 6 <i>Selection, mutations, evolution: an asymptotic analysis</i>
	Luigi Preziosi, Politecnico di Torino <i>Modeling tumour growth</i>
	Angela Stevens, Universität Heidelberg <i>Mathematical models for structure formation in interacting cell systems</i>

**Conference on Mathematical Biology:
Modeling and Differential Equations**

Dates: 9-13 February 2009

Participants: 99

Speakers:	Tomás Alarcón, Imperial College Azmy S. Ackleh, University of Louisiana at Lafayette Adrien Blanchet, Laboratoire Painlevé, USTL Nick Britton, University of Bath Fabio A. C. C. Chalub, Universidade de Lisboa Laurent Desvillettes, École Normale Supérieure de Cachan Odo Diekmann, Universiteit Utrecht Jean Dolbeault, Université Paris Dauphine Blas Echebarria, Universitat Politècnica de Catalunya Georgii T. Guria, National Hematology Research Center Mats Gyllenberg, University of Helsinki Miguel Ángel Herrero, Universidad Complutense de Madrid Danielle Hilhorst, Université Paris-Sud Mimmo Iannelli, Università di Trento Pierre E. Jabin, Université de Nice – Sophia Antipolis Thomas Laurent, University of California at Los Angeles Kalle Parvinen, University of Turku Andrea Pugliese, Università di Trento Joan Saldaña, Universitat de Girona Christian Schmeiser, Technische Universität Wien Juan Soler, Universidad de Granada Antonio Suárez, Universidad de Sevilla Juan J. Velázquez, Universidad Complutense de Madrid Vitaly Volpert, Université Claude Bernard, Lyon 1
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**Workshop and Advanced Course on Deterministic and Stochastic
Modelling in Computational Neuroscience and other Biological Topics**

Dates: 11-15 May 2009

Participants: 65

Lecturers:

Gustavo Deco, Universitat Pompeu Fabra

The neurodynamics of attention, memory and decision-making

Louis Tao, Peking University

Modelling large-scale dynamics in the primary visual cortex

Juan J. Velázquez, Universidad Complutense de Madrid

Stochastic processes and PDEs in mathematical biology

2.3.2. Harmonic Analysis, Geometric Measure Theory and Quasiconformal Mappings

Duration: February to July 2009

Participants: 90 person months

Coordinators: Xavier Tolsa, ICREA and Universitat Autònoma de Barcelona

Joan Verdera, Universitat Autònoma de Barcelona

Scientific Committee: Joan Mateu, Universitat Autònoma de Barcelona

Pertti Mattila, University of Helsinki

Joan Orobitg, Universitat Autònoma de Barcelona

Carlos Pérez, Universidad de Sevilla

Xavier Tolsa, ICREA and Universitat Autònoma de Barcelona

Summary: This research programme was conceived and has been developed as an intensive research period of one semester. The main goals of the programme were, on one hand, establishing the state of the art of the relationships between the three fields in the title (harmonic analysis, quasiconformal mappings and geometric measure theory), and, on the other hand, exploring the possibilities of enhancing and broadening the mutual interconnections.

The programme was structured around two types of events: advanced courses in different topics delivered by leading specialists in their areas and a final conference in June 2009. Between these events, the research work was conducted by local personnel and visitors, either resident at the CRM or just short time visitors involved in some event or giving a lecture. The advanced courses were delivered during two one-week periods, respectively in March and April and a 10-day period in May.

Activities: **Weekly Seminar of Harmonic Analysis**

Speakers: Ignacio Uriarte-Tuero (Michigan), Pertti Mattila (Helsinki), Vasillis Chousionis (Helsinki), Pekka Koskela (Jyväskylä), Paweł Strzelecki (Warsaw), Armen Vagharshakyan (Georgia), Carlos Pérez (Sevilla), Pablo Shmerkin (Manchester), Tadeusz Iwaniec (Syracuse), Steffen Rodhe (Washington), Tadeusz Iwaniec (Syracuse), Eero Saksman (Helsinki), Antoni O'Farrell (Ireland), M. Carmen Reguera (Georgia), Rodolfo Torres (Kansas), Michael Lacey (Georgia), Xavier Tolsa (ICREA-UAB), Daniel Aalto (Turku), Brett Wick (South Carolina), Piotr Hajłasz (Pittsburg), Dmitry Bilyk (IAS), Antti Käenmäki (Jyväskylä), Isabella Laba (British Columbia), Jill Pipher (Brown), Eduardo Gatto (DePaul).

Harmonic Analysis and PDE: Fluid Mechanics and Kato's Problem

Dates: 9-13 March 2009

Participants: 26

Speakers: Michael Lacey, Georgia Institute of Technology

The Kato square root theorem

Diego Córdoba, CSIC, Madrid

Incompressible Euler and related equations

Multilinear Harmonic Analysis and Weights

Dates: 4-8 May 2009

Participants: 32

Speakers: Loukas Grafakos, University of Missouri-Columbia

Multilinear Calderón-Zygmund singular integrals: background and recent developments

Carlos Pérez, Universidad de Sevilla

Calderón-Zygmund operators and weights: sharp bounds and open questions

Four Advanced Courses on Quasiconformal Mappings, PDE and Geometric Measure Theory

Dates: 3-12 June 2009

Participants: 68

Lecturers: Kari Astala, University of Helsinki

The Calderón's inverse problem (10 hours)

Giovanna Citti, Università di Bologna

The Heisenberg group and cortex vision (5 hours)

David Preiss, University of Warwick

Geometric measure theory (5 hours)

Xiao Zhong, University of Jyväskylä

Second order operators in divergence form and QC mappings (10 hours)



Conference on Harmonic Analysis, Geometric Measure Theory and Quasiconformal Mappings

(An ESF-EMS-ERCOM Mathematics Conference)

Dates: 14-20 June 2009

Participants: 105

Speakers: Kari Astala, University of Helsinki

Pascal Auscher, Université Paris-Sud

Rodrigo Bañuelos, Purdue University

Luca Capogna, University of Arkansas

Giovanna Citti, Università di Bologna

Marianna Csörnyei, University College London
Guy David, Université Paris-Sud
Daniel Faraco, Universidad Autónoma de Madrid
John B. Garnett, University of California at Los Angeles
Piotr Hajłasz, University of Pittsburgh
Alex Iosevich, University of Missouri-Columbia
Tadeusz Iwaniec, University of Syracuse
Loredana Lanzani, University of Arkansas
Gaven Martin, Massey University
Jani Onninen, Syracuse University
Eero Saksman, University of Helsinki
László Székelyhidi, Universität Bonn
Tatiana Toro, University of Washington
Rodolfo Torres, University of Kansas
Alexander Volberg, Michigan State University
Xiao Zhong, Jyväskylä Universitet

2.3.3. Probabilistic Techniques in Computer Science

<i>Duration:</i>	September to December 2009
<i>Participants:</i>	31 person months
<i>Coordinators:</i>	Josep Díaz, LSI, Universitat Politècnica de Catalunya Lefteris Kirousis, University of Patras Conrado Martínez, LSI, Universitat Politècnica de Catalunya
<i>Summary:</i>	<p><i>Probabilistic techniques in computer science constitutes a well developed area of research that combines theoretical computer science, discrete mathematics, probability theory and combinatorics. Hundreds of papers on probabilistic techniques appear each year in journals and conference proceedings, both general and specialized in this area, contributing with fresh ideas and opening novel paths of research.</i></p> <p><i>There are two basic lines of research in the area. In one of them, the goal is to obtain precise and mathematically rigorous probabilistic predictions about the performance of algorithms. For many important algorithms, the worst-case performance has little practical relevance as it is highly unlikely; on the contrary, an understanding of their behavior in typical situations is of great practical value, as well as scientifically appealing. Besides that, many useful algorithms and data structures using randomization have been developed in recent years, for which probabilistic analysis is just the right tool.</i></p> <p><i>The other main line of research makes use of probabilistic techniques in the study of combinatorial objects relevant to computer science. For a concrete example that has attracted much interest lately, consider the study of thresholds for properties of combinatorial objects. Boolean formulas of a fixed clause length are a paradigmatic example. It has been observed by simulation experiments that if the clauses to variables ratio (density) of a random formula is below a constant number (~4.25, for 3-CNF formulas) then the formula</i></p>

is asymptotically (as the number of variables grows large) almost always satisfiable. If the density is larger than this threshold number, then the formula is asymptotically almost always non-satisfiable. Several researchers obtained rigorous mathematical proofs for lower and upper bounds of such thresholds and have studied the geometry of the solution space. This area is characterized by an interesting cross-fertilization of ideas between physics on one hand and probability theory, combinatorics and discrete mathematics on the other.

Although the above two lines of research (one concentrating mainly on the probabilistic analysis of algorithms and the other on the study of combinatorial objects from a probabilistic viewpoint) complement each other and contribute to the richness of the field, there was, for some time, a clear danger that the field evolved into separate branches with little or no mutual understanding.

One of the main objectives of this research programme was to bring into closer contact researchers from both communities and thus contribute to the further advancement of the field. The programme thus added to several recent similar initiatives to bridge the two approaches.

The Programme spanned about three months, from September 7th, 2009 until December 4th, 2009. During this period, 20 to 25 people from abroad were invited, most of them well recognized senior researchers, but some post-doctoral researchers as well. Each of the invited researchers stayed at CRM from two weeks to the full length of the programme. Besides informal meetings and exchanges between invited and local researchers and students, the programme included several scheduled regular activities: A seminar of 12 weeks (all but the conference and workshop weeks, see below); a 1-hour lecture per week, with presentations of out-going work and recent results; an international conference entitled International Conference on Probabilistic Techniques in Computer Science, September 14-18, 2009; and two international workshops: Techniques and Challenges from Statistical Physics (October 14-16, 2009), and Mathematical Aspects of Large Networks (November 18-20, 2009).

Activities:

Conference on Probabilistic Techniques in Computer Science

Dates: 14-28 September 2009

Participants: 62

Speakers:

Dimitris Achlioptas, University of California at Santa Cruz

Amin Cja-Oghlan, University of Edinburgh

Benjamin Doerr, Max-Planck-Institut für Informatik

Leslie Goldberg, University of Liverpool

Mordecai Golin, The Hong Kong University of Sciences and Technology

Hsien-Kuei, Academia Sinica

Gábor Lugosi, Universitat Pompeu Fabra

Elitza Maneva, Universitat Politècnica de Catalunya

Mike Molloy, University of Toronto

Prasad Tetali, Georgia Institute of Technology
Osamu Watanabe, Tokyo Institute of Technology
Nicholas Wormald, University of Waterloo



Workshop on Techniques and Challenges from Statistical Physics

Dates: 14-16 October 2009

Participants: 42

Speakers:

Erik Aurell (Stockholm), Amin Coja-Oghlan (Edinburgh), Hervé Daudé (Marseille), Martin Dyer (Leeds), Gabriel Istrate (Timisoara), Yoshiyuki Kabashima (Tokyo), Lefteris Kirousis (Patras), Roman Kotecký (Prague), Florent Krzakala (Paristech), Gábor Lugosi (Barcelona), Fabio Martinelli (Roma), Alexander Mozeika (Aston), Federico Ricci-Tersenghi (Roma), Antonello Scardicchio (Trieste), Guilhem Semerjian (ENS Paris), Lenka Zdeborova (Los Alamos), Riccardo Zecchina (Torino).

Workshop on Mathematical Aspects of Large Networks

Dates: 18-20 November 2009

Participants: 44

Speakers:

Francesc Comellas (Barcelona), Artur Czumaj (Warwick), Philippe Jacquet (INRIA Rocquencourt), Elias Kotsoupias (Athens), Stefano Leonardi (Roma), Alberto Marchetti-Spaccamela (Roma), Tobias Müller (Amsterdam), Jaroslav Nešetřil (Prague).

2.3.4. The Infinity Project

<i>Duration:</i>	September 2009 to July 2011
<i>Participants in 2009:</i>	11 person months
<i>Coordinator:</i>	Sy-David Friedman, Kurt Gödel Research Center, Vienna
<i>Summary:</i>	<p><i>This is a multidisciplinary research project, funded by the John Templeton Foundation. The Infinity Postdocs will join the Invited Research Visitors, the Project Director and Barcelona logicians to discover radically new connections between different areas of logic in the context of the seven project themes.</i></p>

Year 1: We will explore the following four themes:

- 1. History of Set Theory (Loren Graham, Jean-Michel Kantor)
Cantor's correspondence, the Luzin archive and Hausdorff's work in descriptive set theory.*
- 2. Sets and Computations (Sam Buss, Jan Krajicek)
Forcing in complexity theory.*
- 3. Sets and Proofs (Michael Rathjen, Andreas Weiermann)
Large cardinals and proof-theoretic ordinals.*
- 4. Sets and Models (John Baldwin, Tapani Hyttinen)
Descriptive set theory and first-order model theory.
Abstract elementary classes and axioms for set theory.*

Year 2: We will continue the work of Year 1 and also explore the remaining three project themes (Invited Research Visitors to be announced):

- 5. Computations and Proofs*
- 6. Computations and Models*
- 7. Proofs and Models*

2.3.5. Arithmetic Geometry

<i>Duration:</i>	September 2009 to July 2010
<i>Participants in 2009:</i>	61
<i>Coordinators:</i>	Francesc Bars, Universitat Autònoma de Barcelona Luis Dieulefait, Universitat de Barcelona Víctor Rotger, Universitat Politècnica de Catalunya
<i>Scientific Committee:</i>	Henri Darmon, McGill University, Montreal Fred Diamond, King's College, London Luis Dieulefait, Universitat de Barcelona Bas Edixhoven, Universiteit Leiden Víctor Rotger, Universitat Politècnica de Catalunya

Summary: *In this research programme, we will explore several key objects from the arithmetic of number fields/function fields which constitute a living proof of this fruitful cross-fertilization between the two worlds, such as Drinfeld and classi-*

cal modular varieties, classical and p -adic L -functions, the Langlands programme, the Birch and Swinnerton-Dyer conjecture, Iwasawa theory and the Bloch–Kato conjecture.

The first and third quadrimesters of the programme will be focused on arithmetic geometry in the number field case, with an emphasis on modular forms and modularity questions, while the second quadrimester will be dedicated to the function field case in characteristic p , with an emphasis on Iwasawa theory and characteristic p L -functions.

The main topic during the first period (September–December 2009) was the Arithmetic of Modular Forms and Modularity. Several long-standing conjectures have been settled and fundamental progress has been achieved towards others. In addition, precise variants and generalizations of these conjectures have been raised, and these demand refinements of the existing methods as well as completely new ideas in order to be approached. Some of these major achievements take the form of modularity results, which aim to establish a bridge between algebraic varieties or abstract geometric Galois representations on one side and modular or automorphic forms on a Shimura variety on the other. Prominent instances of this philosophy are Serre’s Modularity Conjecture and Fontaine–Mazur’s Conjecture, among others. In parallel, the diophantine study of algebraic varieties has received a dramatic impulse over the last years provided they can be shown to be modular. Thanks to the celebrated result of Wiles and his collaborators, elliptic curves over the field of rational numbers provide the simplest (but highly non-trivial) examples of this phenomenon, and their arithmetic still offers deep questions which remain unsolved. The construction of rational points on them, the Birch and Swinnerton-Dyer Conjecture, its p -adic formulations and generalizations to higher dimensional abelian varieties over number fields are certainly one of them. So far, most insights to these problems exploit and are conditional to the fact that they appear as a factor of the Jacobian of a suitable modular or Shimura curve.

Computation has played a crucial role in the formulation of some of the most important conjectures involving modular forms and elliptic curves in the last decades. Nowadays a wide variety of algorithms, packages and software is available and, for this reason, the research programme will also focus on the computational side and the explicit approaches to the subject. Doubtlessly, number-theorists mainly interested in theoretical questions will benefit from a close interaction with those with a more computer-oriented background, and conversely.

Activities:

Advanced Course on Shimura Varieties and L -functions

Dates: 19–24 October 2009

Participants: 31

Lecturers:

Shou-Wu Zhang, Columbia University
Andrei Yafaev, University College London
Bas Edixhoven, Universiteit Leiden



**Advanced Course on Algebraic Cycles, Modular Forms, and Rational Points
on Elliptic Curves**

Dates: 9-12 December 2009

Participants: 62

Lecturers:

Henri Darmon, McGill University, Montreal

Kartik Prasanna, University of Maryland at College Park



Workshop on Cycles and Special Values of L-series

Dates: 14-18 December 2009

Participants: 66

Speakers:

Jan Bruinier (Darmstadt), François Brunault (Lyon), José I. Burgos (Barcelona), Pierre Charollois (Paris), Christophe Cornut (Paris), Samit Dasgupta (Santa Cruz), Mladen Dimitrov (Paris), Tim Dokchitser (Cambridge), Matthew Greenberg (Calgary), Benjamin Howard (Boston), Anton Mellit (Bonn), Stefan Müller-Stach (Mainz), Jan Nekovar (Paris), Jee Hoon Park (Montreal), Robert Pollack (Boston), Víctor Rotger (Barcelona), Karl Rubin (Irvine), Marco Seveso (Milano), Michael Spiess (Bielefeld), Glenn Stevens (Boston), Eric Urban (New York), Tonghai Yang (Wisconsin), Wei Zhang (Harvard).

2.4. Congressos i workshops

En aquest apartat i en els següents es detallen els congressos, *workshops*, cursos avançats i jornades temàtiques que va organitzar el CRM durant l'any 2009 al marge dels programes de recerca.

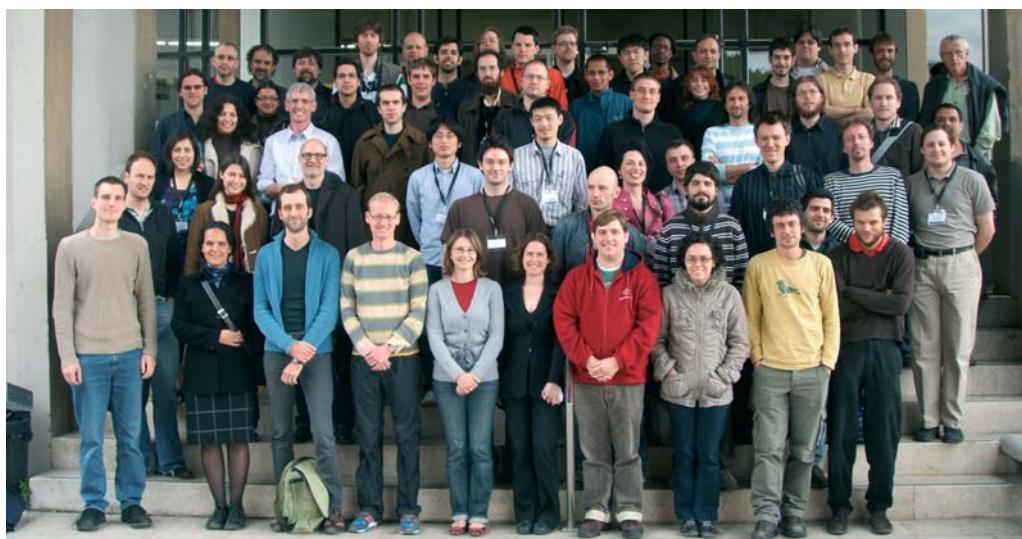
2.4.1. Young Researchers in Set Theory Workshop 2009

Dates: 14-18 April 2009

Participants: 64

Plenary Speakers: Mirna Dzamonja (East Anglia), Moti Gitik (Tel-Aviv), Ernest Schimmerling (Carnegie Mellon), Boban Velickovic (Paris 7).

Post-doc Speakers: Andrew Brooke-Taylor (Bristol), Bernhard König (Toronto), Jordi López-Abad (CSIC), Luís Pereira (Paris 7), Hiroshi Sakai (Kobe), Dima Sinapova (Irvine), Asger Törnquist (Vienna).



2.4. Conferences and Workshops

This section and the following ones contain information about conferences, workshops, advanced courses and thematic days organised by the CRM outside the research programmes in 2009.

2.4.2. Sage Days Barcelona

Dates:	22-27 June 2009
Participants:	49
Speakers:	Michael Abshoff, Technische Universität Dortmund Martin Albrecht, University of London John Cremona, University of Nottingham Enrique González-Jiménez, Universidad Autónoma de Madrid Robert Miller, University of Washington Joaquim Puig, Universitat Politècnica de Catalunya Jordi Quer, Universitat Politècnica de Catalunya William Stein, University of Washington Gonzalo Tornaria, Universidad de la República de Uruguay

2.5. Cursos avançats

2.5. Advanced Courses

2.5.1. i-MATH Winter School DocCourse Combinatorics and Geometry: Discrete and Computational Geometry

Dates:	8 January - 27 March 2009
Participants:	47
Coordinators:	Marc Noy, Universitat Politècnica de Catalunya Ferran Hurtado, Universitat Politècnica de Catalunya Julian Pfeifle, Universitat Politècnica de Catalunya Francisco Santos, Universidad de Cantabria
Lecturers:	Jiří Matoušek, Univerzita Karlova, Praha Günter Ziegler, Technische Universität, Berlin
Seminar Speakers:	Oswin Aichholzer, Imre Bárány, Stefan Felsner, Peter Gruber, Martin Henk, M. Ángeles Hernández, Michael Joswig, Gil Kalai, Gyula Károlyi, Michel Pocchiola, Francisco Santos, Frank Vallentin.



2.5.2. Barcelona Financial Engineering Summer School: The Practice of Derivatives Modeling

Dates:	30 June – 3 July 2009
Participants:	26
Coordinators:	Sebastian del Baño, Centre de Recerca Matemàtica José Luis Fernández, Analistas Financieros Internacionales, Madrid Marta Sanz-Solé, Universidad de Barcelona
Lecturers:	Mike Giles, University of Oxford <i>Computational finance on GPUs</i>
	Rüdiger Frey, Universität Leipzig <i>Pricing and hedging of portfolio credit derivatives: Introduction and recent developments</i>

Mark Davis, Imperial College
Contagion models in credit risk



2.5.3. i-MATH Advanced Course on Optimization: Theory, Methods and Applications

Dates:	20-24 July 2009
Participants:	70
Lecturers:	Jean-Bernard Lasserre, CNRS, France <i>Moments, sums of squares and semidefinite programming</i>
	Francisco Facchini, Università di Roma <i>Generalized Nash equilibria and their computation</i>
	Roberto Cominetti, Universidad de Chile <i>Equilibrium and learning in traffic network games</i>

Invited Speakers: Emilio Carrizosa, Universidad de Sevilla
DC optimization. Algorithms and applications

Laureano Escudero, Universidad Rey Juan Carlos, Madrid
Branching and bounding strategies for multistage stochastic mixed integer programming

Claude Lemaréchal, INRIA Rhône-Alpes
Connections between convex analysis and combinatorial optimization

Justo Puerto, Universidad de Sevilla
On some non-standard location problems

2.6. Curs de màster

El màster de Matemàtiques per als instruments financers va tenir lloc per dotzena vegada el 2009 gràcies a la col·laboració del Departament de Matemàtiques de la UAB, el CRM i diverses entitats: la Borsa de Barcelona (patrocinadora), els departaments d'Economia Aplicada, d'Economia de l'Empresa, i d'Economia i d'Història Econòmica de la UAB, i el Departament d'Estadística de la UB, juntament amb destacats especialistes que treballen en contacte directe amb els mercats. Les empreses col·laboradores que hi donen suport mitjançant les beques per a la realització de pràctiques aporten el component necessari d'aprenentatge pràctic. Així s'estableix una línia directa de col·laboració entre els mons acadèmic i professional, que permet desenvolupar i ensenyar les últimes tècniques de valoració de productes financers derivats, càlcul d'estratègies de cobertura i valuació i control de riscos.

El màster està estructurat en tres etapes, dues de teòriques (cadascuna amb 120 hores de docència) i una tercera etapa pràctica en una empresa de finances. La responsabilitat del màster recau en una Comissió Acadèmica i un Comitè Executiu.

2.6. Master's Course

The CRM master's course on Financial Mathematics was held for the twelfth time in 2009 thanks to the collaboration of the Mathematics Department of the UAB, the CRM, and several financial companies such as the Barcelona Stock Exchange, which is the sponsoring institution. Other collaborating institutions are the departments of Economics and Economics History, Applied Economics, and Business Economics of the UAB, the Statistics Department of the UB, and several outstanding specialists who work in direct contact with the markets. The collaborating companies offer practical training opportunities to the students by offering them grants. This allows a direct contact between the academic community and the professional world, allowing them to develop and teach innovative techniques about the valuation of derived financial products, calculation of coverage strategies, risk assessment and risk control.

The course is structured in three terms, two theoretical, each with 120 hours of teaching, and a third practical in a financial company. The master's responsibility lies on an Academic Commission and an Executive Committee.

2.7. Jornades temàtiques

2.7. Thematic Days

2.7.1. Credit Risk

Date: 28 January 2009
Coordinators: Aureli Alabert, Mathematical Consulting Service, UAB
Lluïsa Parés, AIS Group

2.7.2. Mathematics-Nanoscience Interconsolidar Meeting

Joint meeting of the i-MATH and NANOSELECT projects, organised by the CRM.

Date: 17 April 2009
Coordinators: Enric Canadell, ICMAB-CSIC
Joan Solà-Morales, Centre de Recerca Matemàtica

2.7.3. Fourth Barcelona Weekend in Group Theory

Dates: 24-25 April 2009
Coordinators: Josep Burillo, Universitat Politècnica de Catalunya
Enric Ventura, Universitat Politècnica de Catalunya

2.7.4. The Geometric Langlands Correspondence I

Date: 29 May 2009
Coordinators: Luis Álvarez-Cónsul, CSIC, Madrid
José Ignacio Burgos, Universitat de Barcelona
Óscar García-Prada, CSIC, Madrid
Ignasi Mundet, Universitat de Barcelona

2.7.5. Recordant Erlang: 100 anys de teoria de cues

Date: 2 June 2009
Coordinators: Rosario Delgado, Universitat Autònoma de Barcelona
Frederic Utzet, Universitat Autònoma de Barcelona

2.7.6. Mathematics and Computation: Use of Computational Tools in Mathematical Research

Date: 22 June 2009
Coordinators: Enrique González, Universidad Autónoma de Madrid
Jordi Quer, Universitat Politècnica de Catalunya
Joaquim Puig, Universitat Politècnica de Catalunya

2.7.7. The Geometric Langlands Correspondence II

Date: 3 September 2009
Coordinators: Luis Álvarez-Cónsul, CSIC, Madrid
José Ignacio Burgos, Universitat de Barcelona
Óscar García-Prada, CSIC, Madrid
Ignasi Mundet, Universitat de Barcelona

2.8. Altres activitats

2.8.1. Series of Talks at CosmoCaixa

CosmoCaixa va organitzar un cicle de conferències mensuals sobre l'impacte de les matemàtiques a la ciència i la societat, amb la col·laboració del CRM. El Departament d'Educació de la Generalitat de Catalunya va reconèixer aquest cicle com una activitat de formació permanent per al professorat no universitari.

Dates: January to May 2009
Title of the Series: Mathematics in Science and Society
Coordinator: Manuel Castellet, CRM and UAB

Talks:
Gerhard Frey, Universität Essen
Mathematics and data security

Andrea L. Bertozzi, University of California at Los Angeles
Mathematics, crime and swarming

Mimmo Iannelli, Università di Trento
Mathematics fights epidemics

José Luis Fernández, Universidad Autónoma de Madrid and AFI
Giacomo Casanova y las hipotecas subprime

David Terman, Ohio State University
Mathematics and neuroscience

Joan Girbau, Universitat Autònoma de Barcelona
Matemàtiques i música: una col·laboració de mil·lenis

2.8. Other Activities

CosmoCaixa and the CRM organised together a series of monthly talks about the impact of mathematics on science and society. The Department of Education of the Government of Catalonia granted recognition of a permanent training activity for non-university teaching staff.

Dates: 22-23 January 2009
Place: Barcelona Stock Exchange and AFI, Madrid
Coordinator: Sebastian del Baño, Centre de Recerca Matemàtica

Speaker: Benjamin Nasatyr, Head of Foreign Exchange Quantitative Research
The Royal Bank of Scotland Global Banking and Markets
The trouble with triangles

2.8.3. Seminar Cycle on Computational and Systems Neuroscience

Durant l'any 2009, el CRM també va continuar el seminari de Neurociència computacional i de sistemes, començat el curs 2007-2008, amb sessions mensuals que van tenir lloc a la Universitat Pompeu Fabra i al CRM.

During 2009, the CRM also continued the seminar on Computational and Systems Neuroscience. Monthly sessions were held at the Pompeu Fabra University or at the CRM.

Dates:

January to June 2009 and since September 2009

Coordinators:

Albert Compte, IDIBAPS, Barcelona

Gustavo Deco, Universitat Pompeu Fabra

Antoni Guillamon, Universitat Politècnica de Catalunya

Jordi G. Ojalvo, Universitat Politècnica de Catalunya

Speakers:

Dirk Jancke, Ruhr-Universität Bochum

From luminance changes to natural scenes: Voltage-sensitive dye imaging as a tool to capture large-scale activation dynamics across the brain

Alessandro Treves, SISSA, Trieste

Planning our new memories: An assessment of hippocampal anatomy and physiology

Pablo Villoslada, Hospital Clínic – IDIBAPS

Conceptual organization and retrieval in semantic memory:

The differential role of switching and clustering, acquisition and impairment in neurodegenerative conditions

Pascal Fries, Donders Institute for Brain, Cognition and Behaviour

How your brain ignores (most of) the world

Alex Thiele, Newcastle

Mechanisms and neurochemistry of attention in area V1

David Hanelz, Université Paris Descartes

Balanced spatial working memory

John Rinzel, Courant Institute and Center for Neural Science, New York

Dynamics of perceptual bistability

Misha Rabinovic, Western Reserve University

Mental dynamics

Carlo R. Laing, Massey University

Dimension reduction in neural models: An example – binocular rivalry

2.8.4. Mathematics and Technology Study Groups (GEMT 2009)

Dates:	7-9 July 2009
Coordinators:	Aureli Alabert, Universitat Autònoma de Barcelona Jordi Saludes, Universitat Politècnica de Catalunya Joan Solà-Morales, Universitat Politècnica de Catalunya
Problems:	J. Galtier, Orange/France-Telecom <i>Delay problems on networks</i>
	J. Rius, Departament d'Enginyeria Electrònica, UPC <i>Voltage drop in on-chip power distributions networks</i>
	P. Alemany, Institut de Química Teòrica i Computacional, IQTC-UB <i>Continuous symmetry and shape measures, or how to measure the distance between polyhedra representing molecules</i>

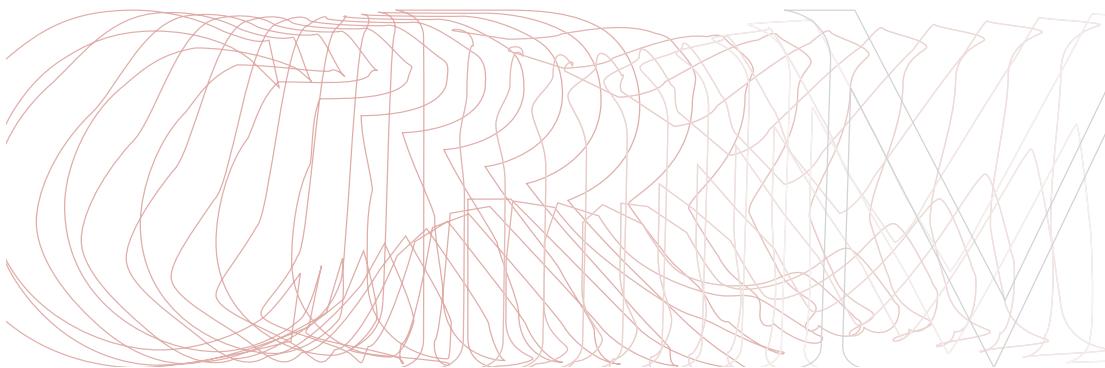
2.8.5. CRM Open Day

El 27 de novembre de 2009, el CRM va organitzar una jornada que ha esdevingut anual i que té dos propòsits: aplegar la comunitat matemàtica local per a un intercanvi informal d'impressions i comptar amb la presència de destacadíssims matemàtics en l'esfera internacional i de responsables de política científica dels diversos governs.

Aquest any, el CRM Open Day serví per a clausurar els actes del 25è aniversari del CRM. Se'n donen més detalls a l'apartat 2.1.

On November 27, 2009, the CRM organised a meeting which is held annually and serves two purposes: to gather together the local mathematical community for an informal exchange of views about current developments, and to offer talks by first-class mathematicians as well as by scientific policy makers.

In 2009, the CRM Open Day served to celebrate the CRM's 25th anniversary. Further details are given in Section 2.1.





Publicacions

Publications

3

3.1. Articles dels investigadors

Els articles següents d'investigadors del CRM han estat publicats o acceptats durant l'any 2009 en revistes científiques de difusió internacional:

3.1. Research Articles

The following articles by CRM researchers were published or accepted for publication in international scientific journals in 2009:

J. M. Cantarero

Twisted equivariant K -theory for actions of Lie groupoids and its completion theorem

Math. Z. (to appear)

A. Corral

Point-occurrence self-similarity in crackling-noise systems and in other complex systems

J. Stat. Mech. P01022 (2009)

A. Corral

Statistical tests for scaling in the inter-event times of earthquakes in California

Int. J. Mod. Phys. B 23, 5570–5582 (2009)

L. H. El Fadil

A public-key cryptosystem based on third order linear sequences

Digital Library of IEEE 10.1109/MMCS.2009.5256643 (501–505)

L. H. El Fadil

Public-key cryptosystem based on second order linear sequences

J. Algebra Comb. (to appear)

L. H. El Fadil

Integral bases of a cubic number field

Commutative Algebra and its Applications, de Gruyter, 2009, 213–221

V. Feuvrier

Remplissage de l'espace euclidien par des complexes polyédriques d'orientation imposée et de rotundité uniforme

Bull. Soc. Math. France (to appear)

V. Feuvrier

Condensation of polyhedral structures onto soap films

arXiv:0906.3505

A. Pastukhov, J. Braun, **P. García**, G. Deco

Multistable perception is never memoryless

ECVP09, Regensburg, 2009

P. García, G. Deco, A. Pastukhov, J. Braun, A. Guillamon

Dynamical insights on the history-dependence during continuous presentation of rivaling stimuli

BMC Neuroscience 2009, 10 (Suppl 1): P364, CNS2009, Berlin

A. Pastukhov, **P. García**, G. Deco, J. Braun

History dependence in multistable perception highlights role of noise

13th Annual Meeting of the ASSC, Berlin, 2009

P. García, G. Deco, A. Pastukhov, J. Braun, A. Guillamon

History-dependence in bi-stable perception: dynamical insights

WACDetSt, Barcelona, 2009

C. Casacuberta, **J. J. Gutiérrez**, I. Moerdijk, R. M. Vogt

Localization of algebras over coloured operads

Proc. London Math. Soc., doi:10.1112/plms/pdp034

J. J. Gutiérrez

Homological localizations of Eilenberg–Mac Lane spectra

Forum Math. 22, no. 2 (2010), 349–356

J. J. Gutiérrez, A. Lukacs, I. Weiss

Dold–Kan correspondence for dendroidal abelian groups

J. Pure Appl. Algebra (to appear)

A. Guillamon, **G. Huguet**

A computational and geometric approach to phase resetting curves and surfaces

SIAM J. Appl. Dyn. Syst. 8(3): 1005–1042, 2009

A. Delshams, **G. Huguet**

Geography of resonances and Arnold diffusion in a priori unstable Hamiltonian systems

Nonlinearity 22(8): 1997–2077, 2009

M. Koerwien

Comparing Borel reducibility and depth of an omega-stable theory
Notre Dame J. Formal Logic 50, no. 4 (2009), 365–380

M. Koerwien

A complicated omega-stable depth 2 theory
J. Symbolic Logic (to appear)

M. Koerwien, S. D. Friedman

On absoluteness of categoricity in AEC's
J. Symbolic Logic (to appear)

F. Matucci

Mather invariants in groups of piecewise-linear homeomorphisms
Combinatorial and Geometric Group Theory, Proceedings of the Dortmund and Carleton Conferences, Trends in Mathematics, 251–260, Birkhäuser, Basel, 2010

M. Kassabov, F. Matucci

Bounding the residual finiteness of free groups
arXiv:0912.2368

J. Díaz, D. Mitsche, X. Pérez-Giménez

On the probability of fixed-size components in random geometric graphs
Adv. Appl. Probability 41.2, 344–357 (2009)

J. Díaz, D. Mitsche, X. Pérez-Giménez

A model for dynamic random geometric graphs
IEEE Trans. Mobile Computing 8(6), 821–835 (2009)

J. Díaz, L. Kirousis, D. Mitsche, X. Pérez-Giménez

On the satisfiability threshold of formulae with three literals per clause
Theoretical Comp. Sci. 410(30–32), 2920–2934 (2009)

R. Saghin, Z. Xia

Geometric expansion, Lyapunov exponents and foliations
Ann. Inst. Henri Poincaré (C), Anal. Non Lin. 26, no. 2 (2009), 689–704

R. Saghin

Note on homology of expanding foliations
Disc. Cont. Dyn. Sys. – Ser. S 2, no. 2 (2009), 349–360

J. Llibre, R. Saghin

Results and open questions on some of the invariants measuring the dynamical complexity of a map
Fund. Math. 206, no. 1–3 (2009), 307–327

G. Smith

Equivariant Plateau problems
Geom. Dedicata 140, no. 1 (2009), 95–135

D. Agbor, **E. Tchoundja**

Toeplitz operators with symbols on Bergman spaces in the unit ball

Adv. Pure Appl. Math. J. (to appear)

M. K. Potapov, B. V. Simonov, **S. Tikhonov**

Relations for moduli of smoothness in various metrics: functions with restrictions on the Fourier coefficients

J. Jour. Approx. 1, no. 2, 205–222 (2009)

E. Liflyand, **S. Tikhonov**

The Fourier transforms of general monotone functions

Analysis and Mathematical Physics, Trends in Mathematics, Birkhäuser, Basel, 377–396, 2009

M. Dyachenko, **S. Tikhonov**

Integrability and continuity of functions represented by trigonometric series: coefficients criteria

Studia Math. 193, no. 3, 285–306 (2009)

E. Nursultanov, **S. Tikhonov**, N. Tleukhanova

Norm inequalities for convolution operators

C. R. Acad. Sci. Paris, Ser. I 347, 1385–1388 (2009)

M. K. Potapov, B. V. Simonov, **S. Tikhonov**

Relations between moduli of smoothness in different metrics

Mosc. Univ. Math. Bull. 64, no. 3, 105–112 (2009); translated for Russian: *Vestnik Mosk. Univ.*, Ser. I 64, no. 3, 17–25 (2009)

S. Tikhonov

Weak type inequalities for moduli of smoothness: the case of limit value parameters

J. Fourier Anal. Appl. (to appear)

M. Ash, **S. Tikhonov**, J. Tung

Wiener's positive Fourier coefficients Theorem in variants of L^p spaces

Michigan Math. J. (to appear)

E. Liflyand, **S. Tikhonov**

A concept of general monotonicity and applications

Math. Nachr. (to appear)

M. K. Potapov, B. V. Simonov, **S. Tikhonov**

Relations between the mixed moduli of smoothness and embedding theorems for Nikolskii classes

Proc Steklov Inst. Math. (to appear)

3.2. Sèries del CRM

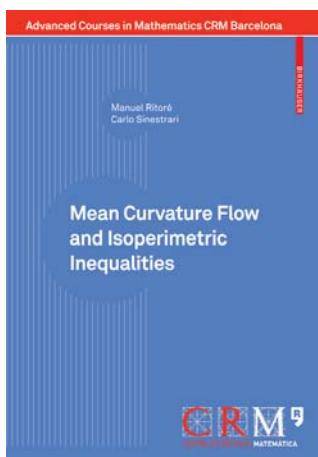
3.2. CRM Series

3.2.1. Advanced Courses in Mathematics CRM Barcelona

Els volums d'aquesta sèrie, publicada per l'editorial suïssa Birkhäuser, recullen el contingut d'alguns dels cursos avançats impartits al CRM, a partir de les notes prèvies lliurades als participants i reelaborades pels autors. Es tracta de llibres de text, especialment adreçats a estudiants de doctorat avançats i a investigadors postdoctorals.

Des de setembre de 2008 l'editor responsable d'aquesta sèrie és Carles Casacuberta. Va substituir en aquest càrrec a Manuel Castellet, que va iniciar la sèrie l'any 2001.

L'any 2009 han aparegut tres volums d'aquesta sèrie:



The volumes of this series, published by the Swiss publishing company Birkhäuser, cover the content of some of the advanced courses taught by specialists at the CRM. They are based on notes handed out to students and later reworked by the authors. These volumes are especially addressed to advanced doctoral and young postdoctoral students.

Since 2008, the responsible editor of this series is Carles Casacuberta. He replaced Manuel Castellet, who started the series in 2001.

Three volumes of this series were published in 2009:

Numerical Solutions of Partial Differential Equations
by S. Bertoluzza, S. Falletta, G. Russo, and C. W. Shu
ISBN: 978-3-7643-8939-0

Combinatorial Number Theory and Additive Group Theory
by A. Geroldinger and I. Z. Ruzsa
ISBN: 978-3-7643-8961-1

Mean Curvature Flow and Isoperimetric Inequalities
by M. Ritoré and C. Sinestrari
edited by V. Miquel and J. Porti
ISBN: 978-3-0346-0212-9

3.2.2. Documents

El CRM va iniciar una nova sèrie de volums amb ISBN l'any 2008, anomenada *Documents*. En aquesta sèrie s'hi publiquen monografies, actes de jornades o congressos, informes de projectes de recerca i altres reculls de material de qualitat. Aquest any 2009 s'ha publicat el següent volum:

Grups d'Estudi de Matemàtiques i Tecnologia (GEMT 2008)
edited by A. Alabert, E. Fossas, and J. Solà-Morales
ISBN: 978-84-613-3301-1

*The CRM launched a new series of volumes with ISBN in 2008, called *Documents*. These include monographs, proceedings of events, reports of research programmes, and other quality material. The following volume was published in 2009:*

3.2.3. Quaderns

La sèrie *Quaderns* recull el contingut d'activitats especialitzades, principalment els apunts lliurats prèviament pel professorat de cursos avançats del CRM. Durant l'any 2008 s'han imprès els exemplars següents:

O. Diekmann, M. Mimura, B. Perthame, L. Preziosi, A. Stevens
Advanced Course on Mathematical Biology: Modeling and Differential Equations
February 2009

G. Deco, J. J. López-Velázquez, L. Tao
Workshop and Advanced Course on Deterministic and Stochastic Modeling in Computational Neuroscience and Other Biological Topics
May 2009

K. Astala, G. Citti, D. Preiss, X. Zhong
Four Advanced Courses on Quasiconformal Mappings, PDE and Geometry Measure Theory
June 2009

R. Cominetti, F. Facchinei, J.-B. Lasserre
Advanced Course on Optimization: Theory, Methods, and Applications
July 2009

B. Edixhoven, S.-W. Zhang, A. Yafaev
Advanced Course on Shimura Varieties and L-functions
October 2009

Booklets in this series contain specialised texts, mostly preliminary notes delivered by lecturers of CRM Advanced Courses. The following issues were printed in 2008:

3.2.4. Preprints

La sèrie de prepublicacions del CRM s'ha incrementat amb els 76 títols següents durant l'any 2009:

The CRM preprint series grew with the following 76 issues in 2009:

G. Huguet, R. de la Llave, Y. Sire
Fast numerical algorithms for the computation of invariant tori in Hamiltonian systems

P. Berger
Persistent bundles over a two dimensional compact set

L. El Fadil
A public key encryption based on third order linear sequences

S. del Baño Rollin, A. Ferreiro-Castilla, F. Utzet
A new look at the Heston characteristic function

M. Anel

Grothendieck topologies from unique factorisation systems

W. Dicks, D. J. Wright

On hyperbolic once-punctured-torus bundles IV: automata for lightning curves

C. A. Tudor

Hsu–Robbins and Spitzer's theorems for the variations of fractional Brownian motion

O. Bogopolski, E. Ventura

A recursive presentation for Mihailova's subgroup

J. Z. Farkas, P. Hinow

On a size-structured two-phase population model with infinite states-at-birth

O. Bogopolski, E. Ventura

On uniform conjugators in torsion-free hyperbolic groups

K. Hess, A. Tonks

The loop group and the cobar construction

M. Iannelli, J. Ripoll

Asynchronous growth and competition in a two-sex age-structured population model

J. Mateu, J. Orobital, C. Pérez, J. Verdera

New estimates for the maximal singular integral

A. Daniilidis, C. H. Jeffrey Pang

Continuity of set-valued maps revisited in the light of tame geometry

F. Cui, Y.-M. Ding

Conjugacy of piecewise linear Lorenz map that expand on average

X. Cabré, J. Tan

Positive solutions of nonlinear problems involving the square root of the Laplacian

E. Liflyand, R. Trigub

Known and new results on absolute convergence of Fourier integrals

R. de la Llave, E. Valdinoci

Symmetry for a Dirichlet–Neumann problem arising in water waves

M. T. Lacey, K. Moen, C. Pérez, R. H. Torres

Sharp weighted bounds for fractional integral operators

- M. T. Lacey, S. Petermichl, M. C. Reguera
Sharp A_2 inequality for Haar shift operators
- X. Tolsa, I. Uriarte-Tuero
Quasiconformal maps, analytic capacity, and non linear potentials
- J. Z. Farkas, P. Hinow
Structured and unstructured continuous models for Wolbachia infections
- J. Z. Farkas, D. Green, P. Hinow
Semigroup analysis of structured populations with distributed states-at-birth arising in mathematical aquaculture
- M. B. Erdogan, N. Tzirakis, V. Zharnitsky
Near-linear dynamics in KdV with periodic boundary conditions
- N. Gambino, J. Kock
Polynomial functors and polynomial monads
- G. Smith
Moduli of flat conformal structures of hyperbolic type
- V. Chousionis, P. Mattila
Singular integrals on Ahlfors–David regular subsets of the Heisenberg group
- G. Smith
The non-linear Dirichlet problem in Hadamard manifolds
- V. Feuvrier
Condensation of polyhedral structures onto soap films
- T. M. Fiore, W. Lück, R. Sauer
Finiteness obstructions and Euler characteristics of categories
- E. Montbrió, D. Pazó
On the existence of hysteresis in the Kuramoto model with bimodal frequency distributions
- E. Montbrió, A. Roxin
The role of fixed delays in neuronal rate models
- I. Gálvez-Carrillo, A. Tonks, B. Vallette
Homotopy Batalin–Vilkovisky algebras
- D. Bilyk, M. T. Lacey, I. Parissis, A. Vaghashakyan
A three dimensional signed small ball inequality
- E. Nursultanov, S. Tikhonov, N. Tleukhanova
Norm convolution inequalities in Lebesgue spaces
- J. B. Garnett, T. M. Le, L. A. Vese
Some variational problems from image processing

M. T. Lacey, E. T. Sawyer, I. Uriarte-Tuero
A characterization of two weight norm inequalities for maximal singular integrals

R. Herrera
Parallel spinors on pseudo-riemannian spin^a manifolds

A. Volberg, B. D. Wick
Bergman-type singular operators and the characterization of Carleson measures for Besov–Sobolev spaces on the complex ball

A. Calsina, J. M. Palmada, J. Ripoll
Optimal latent period in a bacteriophage population model structured by infection-age

M. T. Lacey, T. P. Hytönen, A. Végharshakyan, M. C. Reguera
Weak-type estimates for Haar shift operators: Sharp power on the A_p characteristic

J. B. Garnett, R. Killip, R. Schul
A doubling measure on \mathbf{R}^d can charge a rectifiable curve

J. A. Cañizo, J. A. Carrillo, J. Rosado
A well-posedness theory in measures for some kinetic models of collective motion

J. A. Carrillo, M. Fornasier, J. Rosado, G. Toscani
Asymptotic flocking dynamics for the kinetic Cucker–Smale model

J. A. Carrillo, L. Desvillettes, K. Fellner
Rigorous derivation of a nonlinear diffusion equation as fast-reaction limit of a continuous coagulation-fragmentation model with diffusion

J. Galante, V. Kaloshin
Destruction of invariant curves in the restricted circular planar three body problem using comparison of action

I. Laba, M. Pramanik
Maximal operators and differentiation theorems for sparse sets

J. A. Cañizo, L. Desvillettes, K. Fellner
Regularity and mass conservation for discrete coagulation-fragmentation equations with diffusion

M. Burger, J. A. Carrillo, M. T. Wolfram
A mixed finite element method for nonlinear diffusion equations

J. Tan
The Brezis–Nirenberg type problem involving the square root of the Laplacian

- K. Fellner, G. Raoul
Stable stationary states of non-local interaction equations
- R. Borges, A. Calsina, S. Cuadrado
Oscillations in a molecular structured cell population model
- E. Durand, J. A. Jaramillo, N. Shanmugalingam
Connections between ∞ -Poincaré inequality, quasi-convexity, and $N^{1,\infty}$
- H. Herrera, R. Herrera
Complex contact manifolds and S^1 actions
- E. A. Gallardo-Gutiérrez, M. J. González, F. Pérez-González, C. Pommerenke, J. Rättyä
Locally univalent functions, VMOA, and the Dirichlet space
- K. M. Ehlers, J. Koiller
Could cell membranes produce acoustic streaming? Making the case for synechococcus self-propulsion
- A. L. Bertozzi, T. Laurent, J. Rosado
 L^p theory for the multidimensional aggregation equation
- B. Ayuso, J. A. Carrillo, C.-W. Shu
Discontinuous Galerkin methods for the one-dimensional Vlasov–Poisson system
- C. Martínez, A. Panholzer, H. Prodinger
The analysis of approximate quickselect and related problems
- M. T. Lacey, E. T. Sawyer, I. Uriarte-Tuero
Two weight inequalities for discrete positive operators
- M. T. Lacey, E. T. Sawyer, I. Uriarte-Tuero
Two weight inequalities for maximal truncations of dyadic Calderón–Zygmund operators
- J. I. Giribet, A. Maestripieri, F. Martínez
Abstract splines in Krein spaces
- D. Bilyk, X. Ma, J. Pipher, C. Spencer
Directional discrepancy in two dimensions
- J. Gong
A Schoenflies extension theorem for a class of locally bi-Lipschitz homeomorphisms
- M. Gidea, J. LLibre
Symmetric planar central configurations of five bodies: Euler plus two

X. Tolsa

Calderón–Zygmund capacities and Wolff potentials on Cantor sets

I. Prause, X. Tolsa, I. Uriarte-Tuero

Hausdorff measure of quasicircles

L. C. Matioli, W. Sosa, J. Yuan

A numerical algorithm for finding solutions of a generalized Nash equilibrium problem

A. Ferreiro-Castilla, F. Utzetz

Inversion of analytic characteristic functions and infinite convolutions of exponential and Laplace densities

P. Martín, D. Sauzin, T. M. Seara

Exponentially small splitting of separatrices in the perturbed McMillan map

P. Martín, D. Sauzin, T. M. Seara

Resurgence of inner solutions for perturbations of the McMillan map

B. Abed

Generic super-exponential stability of invariant tori in Hamiltonian systems

B. Abed

Generic Nekhoroshev theory without small divisors

C. Bleak, M. Kassabov, F. Matucci

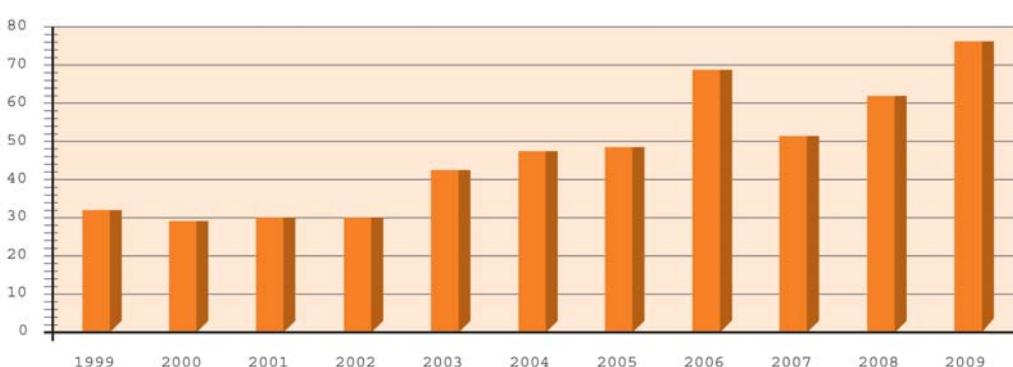
Structure theorems for subgroups of homeomorphism groups

M. Kassabov, F. Matucci

Bounding the residual finiteness of free groups

P. Koskela, P. Lammi

Gehring–Hayman Theorem for conformal deformations



Nombre anual de prepublicaciones del CRM

Annual number of CRM preprints

Resum econòmic *Financial Summary*

4

Compte de resultats abreujat de l'exercici anual finalitzat el 31 de desembre de 2009.

Abridged annual accounts for the year ending on December 31, 2009.

4.1. Ingressos financers

4.1. Financial Income

Ingressos competitius <i>Competitive funding</i>	869.440,68 €
Ingressos no competitius <i>Non-competitive funding</i>	754.000,00 €
TOTAL	1.623.440,68 €

4.2. Despeses financeres

4.2. Financial Expenses

Despeses de personal (administració, investigadors, visitants) <i>Personnel expenses</i> (administration, researchers, visitors)	902.602,91 €
Despeses d'explotació <i>Operating expenses</i>	570.007,86 €
Altres despeses <i>Other expenses</i>	39.987,98 €
Amortització immobilitzat <i>Depreciation of intangibles</i>	86.609,66 €
Resultat financer (despesa) <i>Financial outcome (expenditure)</i>	23.135,22 €
Resultat de l'exercici <i>Annual profit</i>	1.097,05 €
TOTAL	1.623.440,68 €

