CENTRE DE RECERCA MATEMÀTICA REPORT OF ACTIVITIES 2002



Apartat 50 E-08193 Bellaterra crm@crm.es

Graphic design: Teresa Sabater Printing: Limpergraf S.L. Legal Deposit: B. 9505-2003

PRESENTATION

This year 2002 one must point out two events that have taken place in the *Centre de Recerca Matemàtica*, that should have immediate and long term consequences: the change in the legal status of the CRM and the increase of administrative and secretarial personnel.

The III Research Plan for Catalonia 2001-2004 contemplates the assignment of the title *Centres Homologats de Recerca* (Accredited Research Centres), to those centres with proved research excellence in subjects considered of strategic importance. Accordingly, the Catalan Government approved last month of July the constitution of the Consortium *Centre de Recerca Matemàtica*, with its own legal status, formed by the *Institut d'Estudis Catalans* (institution to which the CRM belonged since its creation in 1984) and the Catalan Government, which takes part in the Consortium through its Department of Universities, Research and the Information Society.

With this new legal structure, the Catalan Government acquires a stronger commitment with the CRM. On one hand by setting the main guidelines of the CRM, and on the other hand by ensuring an appropriate and stable financial support that will make possible to carry out the activities planned for the quadrennial period 2003-2006.

Among the innovative tools of this new stage, at the 18th anniversary of the creation of the CRM, one must point out the annual call for Research Programmes among the Catalan mathematical community. The goal is to foster two local research groups every year with the visit of researchers and postdoctoral fellows. Next academic year, we will start the first of these programmes. Its topic is Set Theory and will be co-ordinated by J. Bagaria and S. Todorcevic.

The addition of a new person in the Administration and Secretariat office will allow a more efficient co-ordination of the CRM activities and a better personal attention to our visitors. This action, together with the recent updating of the computer equipment, is intended to facilitate the visit of researchers who come to work temporarily with the Catalan mathematicians thereby increasing the results of past years.

Among this results one must emphasize the participation of the CRM in the programme Improving Human Research Potential of the European Community, which has provided the CRM with a considerable number of Marie Curie post-doctoral fellows and has given financial support for 14 conferences and advanced courses in the last three years, 5 of them in 2002. This year, the CRM has given, once again, its contribution to the European mathematical community. Last March, the Director of the CRM was nominated Chairman of ERCOM by the Executive Committee of the European Mathematical Society. ERCOM is a committee of the EMS formed by institutes that are characterized by hosting an important number of visiting researchers.

> Manuel Castellet Director

CONTENTS

1. The Centre de Recerca Matemàtica 1.1		The Institut d'Estudis Catalans	9
	1.2	The Generalitat de Catalunya	9
	1.3	The Centre de Recerca Matemàtica	10
2. Governing Body and Secretariat	2.1	The Governing Board	11
	2.2	The Director	11
	2.3	The Scientific Advisory Board	11
	2.4	The Secretariat	12
3. Facilities	3.1	Premises	13
	3.2	Computer equipment	13
	3.3	Library	14
	3.4	Housing	14
The Past. Year 2002			
4. Visiting researchers	4.1	General list	17
	4.2	Post-doctoral fellows	21
	4.3	Marie Curie training fellows	22
5. Scientific Activities	5.1	Conferences	23
		5.1.1 Stochastic Inequalities and their Applications	23
		5.1.2 2002 Barcelona Conference on Algebraic Topology	24
		5.1.3 Modular Curves and Abelian Varieties	26
		5.1.4 Séminaire Méditerranéen d'Algebre et Topologie	27
	5.2	Advanced Courses	28
		5.2.1 Mathematical Finance: Further models	28
		5.2.2 Geometric 3-Manifolds	29
	5.3	Mathematical Finance	30
		5.3.1 Master's course in Mathematical Finance	30
		5.3.2 Barcelona Finance Seminar	30
	5.4	Talks and Seminars	31
		5.4.1 Algebra Seminar	31
		5.4.2 Analysis Seminar	31
		5.4.3 Geometry Seminar	33
		5.4.4 Logic Seminar	33
		5.4.5 Probability and Statistics Seminar	34
		5.4.6 Dynamical Systems Seminar	34
		5.4.7 Topology Seminar	35
		5.4.8 Uther talks	35
6. Publications	6.1	Preprints	37
	6.2	Quaderns	38
	6.3	Conferencies	38
	6.4	Advanced Courses in Mathematics CRM Barcelona	38
	6.5	Uther publications	39
7. The European framework	7.1	ERCOM	40
	7.2	EPDI	40
		The CRM in the 5th Framework Programme of the European	
		Union	41

8. The Algebraic Topology Gro	oup	42
9. Ferran Sunyer i Balaguer Fo	undation Prize	43
10. Institucional funding	10.1 Visiting professors (MECyD, DURSI)	44
	10.2 Post-doctorals fellowships (MECyD, DURSI)	44
	10.3 Marie Curie Individual Fellowships (EC)	44
	10.4 Fellowships of the Modern Homotopy	
	Theory network (EC)	44
	10.5 EPDI Fellowships	44
	10.6 Marie Curie Training Site (EC)	44
	10.7 Organisation of Conferences and Advanced Courses	44
11. Budget	11.1 Funding sources	46
	11.2 Expenditure	46
12. The Centre de Recerca Mate	emàtica Consortium	51
12. The Centre de Recerca Mate	emàtica Consortium	51
13. Scientific activities	13.1 CRM Research Programmes	52
	13.2 Other complementary activities of the CRM	52
	13.3 Advanced Courses in Mathematics CRM Barcelona	53
	13.4 The priority thematic areas in the EU 6th Framework	
	Programme	53
	13.5 Enrolment of ICREA visiting researchers	53
	13.6 Master's course in Mathematical Finance	54
	13.7 Master's course in Mathematical Modelling	54
14. Scientific programme for th	e	
year 2003	14.1 Research Programme on Set Theory	55
	14.2 Other research visitors	57
	14.3 Other conferences and advanced courses	58
	14.4 Master Course	58
	14.5 Lectures Ferran Sunyer i Balaguer	58
	14.6 Publications	59

ACRONYMS

CIRIT	Inter-departmental Committee on
	Research and Technological Innovation
CRM	Centre de Recerca Matemàtica
DGR	General Directorate of Research
DURSI	Department of Universities, Research and
	the Information Society
EC	European Community
EMS	European Mathematical Society
EPDI	European Post-doctoral Institute for the
	Mathematical Sciences
ERCOM	European Research Centres on
	Mathematics
EU	European Union
FFSB	Ferran Sunyer i Balaguer Foundation
ICREA	Catalan Institution of Research and
	Advanced Studies
IEC	Institut d'Estudis Catalans
INEFC	Institut Nacional d'Educació Física de
	Catalunya
MCyT	Ministry of Science and Technology
MECyD	Ministry of Education, Culture and Sport
SCM	Catalan Mathematical Society
UAB	Universitat Autònoma de Barcelona
UAM	Universidad Autónoma de Madrid
UB	Universitat de Barcelona
UdG	Universitat de Girona
UPC	Universitat Politècnica de Catalunya
UPF	Universitat Pompeu Fabra
UPM	Universidad Politécnica de Madrid

1. THE CENTRE DE RECERCA MATEMÀTICA

The *Centre de Recerca Matemàtica* (CRM) is a consortium, with its own legal status, integrated by the *Institut d'Estudis Catalans* and the Catalan Government that takes part in it through its Department of Universities, Research and the Information Society. The *Centre de Recerca Matemàtica* is a research institute associated with the *Universitat Autònoma de Barcelona*.

1.1 THE INSTITUT D'ESTUDIS CATALANS

The Institut d'Estudis Catalans $M_{CM} \vee II \times$ The Institut d'Estudis Catalans (Institute for Catalan Studies, IEC), founded in 1907, is an academic, scientific and cultural body whose sphere of activities includes all aspects of Catalan language and culture.

The aim of the IEC is to promote the scientific research, in particular the research related to all aspects of Catalan culture. It contributes to the planning, co-ordination and implementation of research in different fields of science, technology and humanities. Moreover, its own activities further the progress and development of society in general, and, when necessary, acts as an advisor to the government and other institutions.

The IEC is made up of five different sections defined by broad subject units in science, technology and humanities. Each section is formed by a maximum of twentyeight full members. There are 26 societies affiliated to the IEC, with more than 9,000 members; one of them is the Catalan Mathematical Society (SCM).

Web address: http://www.iecat.net

1.2 THE GENERALITAT DE CATALUNYA

The Generalitat de Catalunya is the institution in which the selfgovernment of Catalonia is politically organised through a Parliament and an Autonomous Government. It was created in the thirteenth century, bearing the same name, as an executive body, by the General Courts of the Confederation of the Catalan-Aragonese Crown.

The *Generalitat de Catalunya* participates in the CRM Consortium by means of its Department of Universities, Research and the Information Society (DURSI).

Web address: http://www.gencat.net

1.3 THE CENTRE DE RECERCA MATEMÀTICA

In 1984, the Institut d'Estudis Catalans created the Centre de R Recerca Matemàtica (CRM), with M the main goal of providing Catalan mathematicians with a research institute which would stimulate the improvement of mathematical research in Catalonia, both qualitatively and quantitatively. To achieve this aim, the CRM invites outstanding mathematicians for research visits, facilitates scientific contacts between these visitors and our young local researchers, carries out research programmes, organises lectures, conferences and other scientific meetings, and disseminates research results through its publication series.

On July 9, 2002 the Catalan Government agreed on the foundation of the *Centre de Recerca Matemàtica* (CRM) as a consortium, with its own legal status, formed by the *Institut d'Estudis Catalans* and the Catalan Government through its Department of Universities, Research and the Information Society. The new consortium was formally constituted on the first meeting of the Governing Board, July 25, 2002.

Centre de Recerca Matemàtica Apartat 50 E-08193 Bellaterra Tel.: +34–935811081 Fax: +34–935812202 E-mail: crm@crm.es Web: http://www.crm.es

2. GOVERNING BODY AND SECRETARIAT

2.1 THE GOVERNING BOARD

The CRM is governed by a Governing Board consisting of:

President:

The Minister of Universities, Research and the Information Society, Andreu Mas-Colell. Professor of Mathematical Economy at the UPF.

Members:

The President of the *Institut d'Estudis Catalans*, Josep Laporte. Former Professor of Pharmacology at the UAB.

The General Director of Research of the Catalan Government, Joaquim Casal. Professor of Chemical Engineering at the UPC.

The Vice-Director of Research of the Catalan Government, Joaquim Ibañez.

The Director of the Inter-departmental Committee on Research and Technological Innovation (CIRIT) of the Catalan Government, Antoni Oliva. Professor of Chemical Physics at the UAB.

The Administrative Officer of the IEC, Jordi Vinaixa.

Josep Enric Llebot, full member of the *Institut d'Estudis Catalans* and Professor of Physics of the Condensed Matter at the UAB.

Sebastià Xambó, Professor of Information Theory and Coding at the UPC.

2.2 THE DIRECTOR

The Governing Board elects a Director to serve for a period of four years. The current Director is Manuel Castellet, Professor of Geometry and Topology at the UAB, who was re-elected for the period 2002-2006 at the July 25, 2002 meeting of the Governing Board.

2.3 THE SCIENTIFIC ADVISORY BOARD

The Governing Board, in its meeting of November 2002, agreed to designate as members of the Scientific Advisory Board the following people: Joan Bagaria, ICREA; Àngel Calsina, UdG; Carles Casacuberta, President of the SCM; Vicent Caselles, UPF; Alberto Facchini, Università degli Studi di Padova; Evarist Giné, University of Connecticut; Joan Girbau, UAB; Antoni Huerta, UPC; Jaume Llibre, UAB; Xavier Massaneda, UB; M. Pilar Muñoz, UPC; Joan Carles Naranjo, UB; David Nualart, UB; Joan Porti, UAB; Jordi Quer, UPC; Oriol Serra, UPC; Juan Luis Vázquez, UAM; Sebastià Xambó, Director of the FFSB.

2.4 THE SECRETARIAT

The Centre's staff takes care of facilitating the scientific work of the centre and its visiting members and help make their stay as pleasant and trouble-free as possible.

The members of the staff are:

Maria Julià maria@crm.es +34-935812953 Maria is in charge of the publications, the accounting and attending the computer system of the centre.

Neus Portet nportet@crm.es +34-935814086 Neus is in charge of the visitors and the centre's activities.

Consol Roca croca@crm.es +34-935811081 Consol is in charge of assisting the Director and of the centre's activities.

3. FACILITIES

3.1 PREMISES

The CRM is located in the Science building of the UAB. It occupies a total of 940 square metres, containing 8 single offices, 2 doubles, 3 triples, a secretarial office, a director's office, a computer room, a storage room, 2 lecture rooms (one for 50 people and another one for 25 people), a meeting room and an informal meeting space. All the rooms have central heating and air conditioning.

3.2 COMPUTER EQUIPMENT

The CRM has a LAN Ethernet net of 100 Mbps. There are twenty-five working stations connected to the net and four printers.

Twenty-one of those workstations are distributed in the different offices. There are two printers, two Linux workstations and three Windows workstations in the Computer room.

All workstations are part of a Windows NT Domain supplied by a central server (HP Netserver LC10) that at the same time works as a mail server and DNS server of it's own domain (crm.es). This LAN net is connected to Internet through the UAB net.

It is possible to connect to MathSci-Net from each of the centre's stations.

The Centre has a PC projector and a laptop PC for presentations at the conference room.



3.3 LIBRARY

The CRM visitors have free access to the Science and Engineerings Library of the UAB which contains more than 400 journals and 12,000 volumes in mathematics. The Library catalog is available online.

Web address: http://www.bib.uab.es.

3.4 HOUSING

The CRM has a few rented furnished apartments for the use of its visitors in Sant Cugat del Vallès (a small town connected by train to the UAB campus and to Barcelona) and in the *Vila Universitària*, at the UAB campus. Most of the apartments consist of a dining room with kitchen, a bathroom and one bedroom with two single beds. A few of them have two or three bedrooms, which are suitable for families.

The rent, including utilities, ranges from 450 to 700 euros per month.

Upon request, the apartments may be provided with a telephone connection at the visitors's expense.

THE PAST. YEAR 2002

4. VISITING RESEARCHERS

4.1 GENERAL LIST

N. Dutertre	Geometry, 01.10.2000 – 31.08.2002 Université Aix-Marseille 1
G. Świrszcz	Dynamical Systems, 15.11.2000 – 30.11.2003 Uniwersytet Warszawski
M. Cuvilliez	Algebraic Topology, 02.01.2001 – 31.08.2002 Université Catholique de Louvain
A. Descheemaeker	Algebraic Topology, 02.01.2001 – 31.12.2002 Katholieke Universiteit Leuven
B. Chorny	Algebraic Topology, 01.09.2001 – 28.02.2002 Hebrew University of Jerusalem
A. Delshams	Dynamical Systems, 03.09.2001 – 31.08.2002 Universitat Politècnica de Catalunya
A. Bodin	Geometry, 01.10.2001 – 31.08.2002 Université de Lille 1
D. Chataur	Algebraic Topology, 01.10.2001 – 31.10.2003 Centre de Recerca Matemàtica
G. Collinet	Algebraic Topology, 01.10.2001 – 31.01.2002 École Polytechnique, Palaiseau
P. Derbez	Topology, 01.10.2001 – 30.09.2002 Université de Bourgogne
K. Andersen	Algebraic Topology, 01.12.2001 – 30.08.2002 Kobenhavns Universitet
F. Loray	Differential Geometry, 07.01.2002 – 20.12.2002 Université de Lille 1
A. Troesch	Algebraic Topology, 01.02.2002 – 30.04.2002 Université Paris XIII
D. Labutin	Applied Mathematics, 28.02.2002 – 21.03.2002 ETH-Zürich
M. Eddahbi	Probabilities and Statistics, 01.03.2002 – 31.08.2003 Université Cadi Ayyad
J. Hoffmann	Topology, 04.03.2002 – 31.07.2002 Georg-August Universität
R. El Bashir	Algebra, 11.03.2002 – 17.03.2002 Charles University

S. Dourlens	Algebraic Topology, 01.04.2002 – 31.07.2002 Université de Nice-Sophia Antipolis
B. Bowditch	Algebra, 02.04.2002 – 15.05.2002 University of Southampton
J. Greenlees	Algebraic Topology, 02.04.2002 – 21.04.2002 University of Sheffield
E. Jespers	Algebra, 02.04.2002 – 30.06.2002 Brije Universiteit Brussel
J. Aramayona	Algebra, 15.04.2002 – 10.05.2002 University of Southampton
P. Parent	Algebraic Topology, 15.04.2002 – 15.05.2002 EPF Lausanne
A. Yaman	Algebra, 15.04.2002 – 10.05.2002 University of Southampton
J. Okninski	Algebra, 26.04.2002 – 05.05.2002 Uniwersytet Warszawski
J. Møller	Algebraic Topology, 13.05.2002 – 07.06.2002 Kobenhavns Universitet
N. Kitchloo	Algebraic Topology, 30.05.2002 – 08.07.2002 Johns Hopkins University
D. Notbohm	Algebraic Topology, 01.06.2002 – 07.07.2002 University of Leicester
A. Alexandrov	Analysis, 01.06.2002 – 30.11.2002 Steklov Institute of Mathematics
D. King	Applied Mathematics, 17.06.2002 – 29.06.2002 University of Melbourne
J. Simón-Pinero	Algebra, 17.06.2002 – 30.07.2002 Universidad de Murcia
N. Strickland	Algebraic Topology, 23.06.2002 – 21.07.2002 University of Sheffield
W. Gajda	Algebraic Geometry, 29.06.2002 – 25.07.2002 Northwestern University
T. Björk	Mathematical Finance, 01.07.2002 – 06.07.2002 Stockholm School of Economics
J. Grodal	Algebraic Topology, 01.07.2002 – 31.07.2002 University of Chicago
T. Mikosch	Mathematical Finance, 01.07.2002 – 06.07.2002 Kobenhavns Universitet

Mathematical Finance, 01.07.2002 – 06.07.2002 Oxford University
Algebraic Topology, 01.07.2002 – 01.08.2002 Université Paris XIII
Algebraic Topology, 02.07.2002 – 31.07.2002 University of Aberdeen
Dynamical Systems, 01.09.2002 – 31.08.2003 Peking University
Rings Theory, 01.09.2002 – 31.01.2003 Charles University
Commutative Algebra, 01.09.2002 – 31.08.2003 Meiji University
Algebraic Topology, 02.09.2002 – 31.08.2003 Univerza v Ljubljani
Applied Mathematics, 02.09.2002 – 30.09.2002 Instituto de Matemática, Lima
Geometry, 08.09.2002 – 28.02.2003 University of Michigan
Geometry, 10.09.2002 – 29.09.2002 Peking University
Geometric Topology, 12.09.2002 – 20.09.2002 Université Paul Sabatier
Topology, 12.09.2002 – 20.09.2002 Universität Tübingen
Geometric Topology, 12.09.2002 – 20.09.2002 Université d'Orléans
Probability and Statistics, 12.09.2002 – 02.10.2002 Indian Statistical Institute
Algebraic Topology, 15.09.2002 – 15.10.2002 Uniwersytet Warszawski
Stochastic Analysis, 15.09.2002 – 06.10.2002 Université Henri-Poincaré Nancy l
Algebraic Topology, 19.09.2002 – 31.01.2003 Hebrew University of Jerusalem
Algebra, 30.09.2002 – 31.08.2003 Università degli Studi di Padova
Computational Methods, 01.10.2002 – 31.10.2002 Svučilište u Zagrebu

L. Diracca	Algebra, 03.10.2002 – 30.10.2002 Università degli Studi di Padova
C. Ringel	Algebra, 03.10.2002 – 09.10.2002 Universität Bielefeld
A. García	Analysis, 20.10.2002 - 22.12.2002 UNAM
A. Volberg	Harmonic Analysis, 01.11.2002 – 31.04.2003 Michigan State University
Y. Félix	Algebraic Topology, 14.11.2002 – 17.11.2002 Université Catholique de Louvain
J. Møller	Algebraic Topology, 14.11.2002 – 25.11.2002 Kobenhavns Universitet
A. Libman	Algebraic Topology, 02.12.2002 – 31.12.2002 University of Aberdeen
M. Vigué	Algebraic Topology, 14.12.2002 – 17.12.2002 Université Paris XIII
F. Perera	Algebra, 15.12.2002 – 30.01.2003 The Queen's University of Belfast

Number of months of visitors



4.2 POST-DOCTORAL FELLOWS

Among the visiting researchers at the CRM during the year 2001 we note the presence of 12 post-doctoral fellows with stays of more than 9 months, fulfilling one of the foundational aims of the CRM: to facilitate the work of young researchers and their contact with leading scientists. They were:

N. Dutertre	01.10.00 - 31.08.02	(Marie Curie)
G. Świrszcz	15.11.00 - 30.11.03	(CRM, Marie Curie, MECyD)
M. Cuvilliez	01.01.01 - 31.08.02	(Marie Curie)
A. Descheemaeker	01.01.01 - 31.12.02	(Network Modern Homotopy Theory)
P. Derbez	01.10.01 - 30.09.02	(EPDI)
D. Chataur	01.10.01 - 31.10.03	(CRM, Marie Curie)
A. Bodin	01.10.01 - 31.08.02	(CRM, Marie Curie)
K. Andersen	01.12.01 - 31.08.02	(Network Modern Homotopy Theory)
F. Loray	01.01.02 - 20.12.02	(MECyD)
M. Eddabhi	01.03.02 - 31.08.03	(MECyD)
S. lai	01.09.02 - 31.08.03	(MECyD)
T. Beke	08.09.02 - 28.02.03	(Network Modern Homotopy Theory)

Institutional funding



4.3. MARIE CURIE TRAINING FELLOWS

In the year 2000 call of the European Union, the CRM received the nomination of Marie Curie Training Site for its Barcelona Algebraic Topology Group, directed by Jaume Aguadé (UAB). During the year 2002, the group has hosted several doctoral students of Topology programmes from different universities of the European Community or from associated states. They have been:

- B. Chorny Hebrew University of Jerusalem
- G. Collinet École Polytechnique, Palaiseau
- A. Troesch Université Paris XIII
- J.-Ph. Hoffmann Universität Göttingen
- S. Dourlens Université de Nice
- J. Smrekar Univerza v Ljubljani

5. SCIENTIFIC ACTIVITIES

5.1 CONFERENCES

5.1.1 STOCHASTIC INEQUALITIES AND THEIR APPLICATIONS

From June 17 to 21, 2002 the conference on *Stochastic Inequalities and their Applications* took place at the Science building of the UAB organised by the CRM. The scientific committee was formed by E. Giné (University of Connecticut), Ch. Houdré (Georgia Institute of Technology, Atlanta) and D. Nualart (UB). 83 researchers from all over the world attended the meeting, which was supported by the European Commission in the programme High-level Scientific Conferences, (HPCF-CT-2001-00335), by the Ministry of Science and Technology (BFM2001-4272-E) and by the Department of Universities, Research and the Information Society (2002ARCS 00067).

The following plenary lectures were given:

Nicolai Krylov; Some implications of the Burkholder-Davis-Gundy type inequalities for fully nonlinear degenerate equations in balls.

Rafal Latala; Some estimates of norms of random matrices.

Michel Ledoux; Concentration, transportation and functional inequalities.

Gabor Lugosi; Some new concentration inequalities based on the entropy method.

Pascal Massart; Some applications of concentration inequalities to statistics.

Colin McDiarmid; *Concentration and random permutations*.

Emmanuel Rio; *Concentration inequalities for maxima of empirical processes.*



Ofer Zeitouni; Concentration and large deviation inequalities for random matrics.

Other lectures given:

M. Arcones; Integrability of iterated brownian motion.

A. Baillo; *Total error in a plug-in estimator of density level sets*.

F. Barthe; *Entropy jumps in the presence of a spectral gap*.

S. G. Bobkov; Gaussian tails for distributions of linear functionals over convex bodies.

V. de la Peña; *The LIL for self normalized martingales*.

R. M. Dudley; Inequalities involving p- and Φ -variation.

U. Eeinmahl; *Moderate deviation probabilities for open convex sets in Banach space.*

1. Gyongy; On the rate of convergence of numerical solutions obtained by the splittingup method.

G. Hargé; A correlation inequality between a log-concave function and a convex function.

Ch. Houdré; Concentration of measure for stable and related infinitely divisible random vectors.

A. Kohatsu-Higa; *Lower bounds for elliptic random variables and applications*.

A. Kolesnikov; *Correlation inequalities and diffusion semigroups*.

Vl. Koltchinskii; *Probabilistic inequalities for margin distributions and generalization error.*

l. Kontoyiannis; *Unified error exponents: Hypothesis testing, data compression, and measure concentration.*

J. Kuelbs; *Rates of convergence for the nummelin conditional weak law of large numbers.*

C. W. Li; *Invariant measures for stochastic Jump-diffusions*.

W. Linde; *Small deviations of weighted fractional Brownian motions.*

M. J. Luczak; Stochastic inequalities and the limiting behaviour of large communication networks.

D. M. Mason; An Exponential inequality for the weighted approximation to the uniform empirical process.

L. Mattner; *Inequalities involving binomial distributions*.

L. Miclo; About projections of logarithmic Sobolev inequalities.

K. Oleszkiewicz; On some operator semigroup and Khinchine-Kahane-type inequalities.

1. Pinelis; Spherically symmetric functions with a convex second derivative and applications to extremal probabilistic problems.

P. Reynaud-Bouret; *Exponential inequalities* for U-statistic of order 2 with constants.

J. Rosiński; Radonification of cylindrical semimartingales by a single Hilbert-Schmidt operator.

P.-M. Samson; *Transportation inequalities in product spaces*.

M. Sanz-Solé; Non Autonomous spde's: Path regularity of the solution.

W. Stannat; Long-time behaviour and regularity of measure-valued processes.

L. Zambotti; Absolute continuity in space of the reflecting measure for a parabolic PDE with random obstacle.

5.1.2 2002 BARCELONA CONFERENCE ON ALGEBRAIC TOPOLOGY

The highlights of the 2002 Barcelona Conference on Algebraic Topology (BCAT), held from July 2 to 6, at the seat of the Institut d'Estudis Catalans, were the following:

• The celebration of 20 years of scientific events on Algebraic Topology in Barcelona, which began in 1982 with the first *Workshop on Algebraic Topology*. Events that include 5 editions of the BCAT, 5 advanced courses at the European level and one conference for young topologists.

• The homage in honour of Beno Eckmann, Manuel Castellet's thesis advisor at the ETH in Zürich, in 1973. Castellet's stay at the ETH marked the beginning of the Barcelona Algebraic Topology Research Group. Eckmann also exerted a great influence in the creation of the *Centre de Recerca Matemàtica*, which from its creation has hosted the above mentioned activities.



Professor Beno Eckmann

• The singularity of the scientific programme, which included 3 two-hour plenary addresses by lb Madsen, Haynes Miller and Graeme Segal. We want these addresses to mark the future development of Algebraic Topology. They will be collected in a special publication of international scope.

The scientific committee was formed by J. Aguadé (UAB), C. Broto (UAB), C. Casacuberta (UB) and H. Miller (MIT). The members of the organising committee were G. Bastardas (UAB), N. Castellana (UAB), J. A. Crespo (UAB), A. Ruiz (UAB). 161 researchers from all over the world attended the meeting, which was supported by the European Commission in the programme High-level Scientific Conferences, (HPCF-CT-2002-00246), by the Ministry of Science and Technology (BFM2001-4270-E), by the Department of Universities, Research and the Information Society (2002ARCS 00065) and by the UAB.

Exhibition of 20 years of scientific events on Algebraic Topology in Barcelona



Besides the three two-hour plenary addresses there were six one-hour plenary lectures and twenty-four forty-minutes lectures.

The following plenary lectures were given:

Pete Bousfield; *Homotopical completions of spaces*.

John Greenlees; Algebraic groups and equivariant cohomology theories.

Mark Hovey; Morita theory for Hopf algebroids.

Ran Levi; *p*-local groups: the homotopy theory of fusion systems.

lb Madsen; *The stable moduli space of Riemann surfaces*.

Haynes Miller; *Recent work on elliptic cohomology*.

John Rognes; Waldhausen's stable parametrized h-cobordism theorem.

Graeme Segal; The structure of spaces and manifolds.

Antonio Viruel; *Homotopy characterization* of (classifying spaces of) compact Lie groups.

Other lectures given:

N. A. Baas; Higher order topology.

A. J. Berrick; *The Bass conjecture for amenable groups.*

J. M. Boardman; *Noncommutative ring spec-tra*.

W. Chachólski; Phantom spaces.

D. Davis; v_1 -periodic homotopy groups of compact simple Lie groups.

G. Granja; Homotopy decomposition of groups of symplectomorphisms.

J. Grodal; Classification of homotopy G-actions on spheres. K. Hess; *Algebraic models for topological cyclic homology.*

M. Jakob; *Three-cover of simply connected groups and Pressley-Segal extension.*

M. Joachim; Higher coherences for equivariant K-theory or/and a geometric realization of the Atiyah orientation.

N. Kuhn; Periodic homology of infinite loop spaces.

1. Leary; *The L*²-cohomology of Artin groups.

A. Libman; Homotopy limits of triples and their algebras.

M. Livernet; On an operad built from decorated Teichmüller spaces.

D. Notbohm; *Homology decompositions of spaces*.

B. Oliver; A proof of the Martino-Priddy conjecture.

N. Ray; Homotopy colimits in categories of topological monoids, with applications to toric geometry.

J. Rosický; Left-determined model categories.

P. Salvatore; *The homology of higher free loop spaces*.

J. Scherer; *Plus construction for algebras over an operad and additive K-theories.*

B. Shipley; *Derived equivalences of rings and DGAs*.

S. Tsalidis; On the algebraic K-theory of truncated polynomial rings.

N. Wahl; Infinite loop space structure(s) on the stable mapping class group.

Cl. Wilkerson; Normalizers and fundamental groups for 2-compact groups.

5.1.3 MODULAR CURVES AND ABELIAN VARIETIES

From July 15 to 18, 2002 the conference on *Modular Curves and Abelian Varieties* took place at the Science building of the UAB organised by the CRM. The scientific committee was formed by J. Cremona (University of Nottingham), J. C. Lario (UPC), J. Quer (UPC) and K. Ribet (University of California at Berkeley). The members of the organising committee were J. González (UPC), J. C. Lario (UPC), J. Quer, co-ordinator (UPC) and A. Rio (UPC). 91 researchers from all over



the world attended the meeting, which was supported by the European Commission in the programme High-level Scientific Conferences, (HPCF-CT-2001-00386), by the Ministry of Science and Technology (BFM2001-4280-E), by the Department of Universities, Research and the Information Society (2002ARCS 00062), by the UPC, and by the UAB.

The following plenary lectures were given:

Kevin Buzzard; *Eigencurves in theory and in practice*.

Henri Darmon; Modular parametrisations and algebraic points on elliptic curves.

Jordan S. Ellenberg; *Galois representations* on \mathbb{Q} -curves.

Gerhard Frey; *The Hurwitz space of curves of genus 2 with elliptic differentials.*

Joan C. Lario; *Arithmetic of* Q*-curves*.

Barry Mazur; A conjectural picture of the anti-cyclotomic arithmetic of elliptic curves.

Bjorn Poonen; Modular curves of genus at least two.

Kenneth Ribet; Optimal quotients and Néron models.

William Stein; Non-squareness of Shafarevich-Tate groups of abelian varieties.

Other lectures given:

A. Agashé; Constructing elliptic curves with known number of points over a finite field.

J. Boxall; *Singular torsion points on elliptic curves*.

G. Cardona; \mathbb{Q} -curves and abelian varieties of GL_2 -type from dihedral genus2 curves.

1. Chen; On the rational points of a certain modular curve of level 11.

L. Dieulefait; Irreducibility of symplectic four dimensional Galois representations.

G. Frey; The Hurwitz space of curves of genus 2 with elliptic differentials.

W. Gajda; On support problem for the intermediate jacobians of some l-adic representations.

E. Ghate; Modular endomorphism algebras.

J. Manoharmayum; Large modularity of $GL_2(\mathbb{F}_7)$ representations.

K. McMurdy; Explicit parameterizations of *p*-adic supersingular regions on $X_0(N)$.

T. Nakamura; A classification of \mathbb{Q} -curves with complex multiplication.

V. Rotger; Non-isomorphic curves with isomorphic Jacobian and modularity.

A. Umegaki; On abelian surfaces with complex multiplication.

H. Verrill; Higher weight modular symbols.

S. Wewers; *The arithmetic of noncongruence subgroups*.

5.1.4 SÉMINAIRE MÉDITERRANÉEN D'ALGÈBRE ET TOPOLOGIE

On October 4 and 5, 2002 took place at the CRM the *Séminaire Méditerranéen d'Algèbre et Topologie*, a meeting that takes place every year in different institutions of the Mediterranean area.

There were two short-courses given by the following profesors:

CLAUS MICHAEL RINGEL (Universität Bielefeld) Indecomposable algebraically compact modules for tubular algebras.

JAN TRLIFAJ (Charles University, Prague) *Approximations and the finitistic dimension conjectures:*

a) Approximations and cotorsion pairs.

b) Tilting and cotilting approximations.

c) The finitistic dimension conjectures.

This seminar received financial support from the DURSI and the UAB.

5.2 ADVANCED COURSES

This year for the eighth time, the CRM organised a series of advanced courses on specific subjects that have seen recent development. These intensive courses are addressed to advanced Ph.D. students and recent Ph.D. graduates and taught by well known specialists in each area.

During the year 2002 the following courses were given:

5.2.1 MATHEMATICAL FINANCE: FURTHER MODELS

From July 1 to 6, 2002, co-ordinated by J. del Castillo from the UAB and lectures given by:

TOMAS BJÖRK (Stockholm School of Economics). *Interest rate theory*.

Bond markets and interest rates. Short rate models. The market price of risk. Martingale modelling. Affine term structures. Inverting the yield curve. Forward rate models: The HJM approach. Change of numeraire: The normalized price system, pricing, forward measures, a general option pricing formula.

THOMAS MIKOSCH (Kovenhavns Universitet) *GARCH models & Heavy-tailed distribu-tions.*

Dependence (non-zero correlations of the volatility sequence, clusters of high and low level exceedances) and the occurrence of unusually many very high and very low values (heavy-tailed distributions) are typical for returns series of financial time series. He considered stochastic models for adequately describing these properties. In particular, he studied the celebrated GARCH process in detail and verified how extremes and dependence are explained by this model. NEIL SHEPHARD (Nuffield College, Oxford) *Levy* process and stochastic volability models.

This lecture course focussed on the development of Levy process based stochastic volatility models. An introductory account of Levy processes in finance was given, before establishing their use in stochastic volatility processes. The associated option pricing results were discussed, as the theory of realized volatility built out of these processes.

Other lectures given:

J. Aquilina; Determining interest rates and share prices from equilibrium conditions and agents' preferences.

F. Raciti; *Time dependent spatially distributed market models.*

A. Filinkov; *White noise approach to interest rate models*.

B. Sirakov; Asymptotics for the implied volatility of long-term options.

N. Krejic; Nonlinear complementary problems and numerical methods for their solutions.

J. Vives; On Lévy processes, Malliavin calculus and market models with jumps.

P. McSharry; *Probabilistic forecasting using non-linear models*.

J. M. Corcuera; *Modelling insider's information in the Black-Scholes model.*

G. Dikos; Options Implied Pdf's: Where does Shewnes and Kurtosis come from?

80 researchers and post-doctoral students attended the course, which was supported by the European Commission in the programme High-level Scientific Conferences, (HPCF-CT-2000-00082), by the Ministry of Science and Technology (PGC2000-2203-E), by the Department of Universities, Research and the Information Society (2002ARCS 00063) and by the UAB.

5.2.2 GEOMETRIC 3-MANIFOLDS

From September 12 to 20, 2002, coordinated by J. Porti from the UAB and lectures given by:

MICHEL BOILEAU (Université Paul Sabatier) *Geo*metrization of 3-manifolds with symmetry.

The goal of these lectures was to present a proof that a closed, orientable, irreducible and atoroidal 3-manifold which admits a non-trivial, orientation preserving, non-free symmetry of finite order, admits either an elliptic or hyperbolic metric. Cyclic branched covering along knots or links in S^3 are examples of such manifolds. First he recalled basic facts in 3-dimensional topology and then introduced the main tools needed for the proof. He used results from the lectures of Leeb and Otal.

BERNHARD LEEB (Universität Tübingen) The geometry of cone manifolds and the Orbifold Theorem.

Cone manifolds are singular metric spaces with curvature bounded below and with sigularities of a very restricted type. They play a central role in the geometrization of orbifolds. We discussed basic geometric results concerning their small-scale structure and possible degenerations, and explained how they are used in the proof of the Orbifolds Theorem.

JEAN-PIERRE OTAL (École Normale Supérieure de Lyon) *Holomorphic quadratic differentials and the hyperbolization of Haken 3-mani-folds.*

Thurston's hyperbolization theorem states that the interior of a compact Haken 3-manifold M which is atoroidal carries a hyperbolic metric. One essential step in the proof is a Fixed point theorem for a certain map of the Teichmüller space of M. McMullen gave a new approach to this Fixed point theorem, more analytical than Thurston's original proof. In these lectures, after showing how Thurston's hyperbolization theorem reduces to this Fixed point theorem, he focussed on McMullen's proof.

Other lectures given:

C. Petronio; Complexity of certain hyperbolic *3-manifolds with geodesic boundary*.

K. lchihara; *Heegaard gradient of Seifert fi*bered 3-manifolds.

J. Souto; Tameness for algebraic limits.

F. Gautero; Weak hyperbolization of fibered 3-manifolds with pseudo-AnosovMonodromy.

Sh. Wang; *Maps of non-zero degree between* 3-manifolds.

M. Sakuma; Variations of McShane's identity for punctured surface groups.

H. Weiss; *Rigidity of cone manifolds*.

P. Popescu-Pampu; The address of a knot.

66 researchers and post-doctoral students attended the course, which was supported by the European Commission in the programme High-level Scientific Conferences, (HPCF-CT-2000-00140), by the Ministry of Science and Technology (BFM2001-4308-E), by the Department of Universities, Research and the Information Society (2002ARCS 00064), and by the UAB.

5.3 MATHEMATICAL FINANCE

5.3.1 MASTER'S COURSE IN MATHEMATICAL FINANCE

This is a joint activity of the CRM and the Mathematics Department of the UAB together with several financial institutions. The activity is sponsored by the Barcelona Stock Exchange and has different university departments as collaborators, such as the Applied Economics, Commercial Economics and Economics and History of Economics departments of the UAB, the Statistics Department of the UB, and several distinguished specialists who work in direct contact with the markets. The aim of the Master's course, now in its fifth edition, is to train specialists capable of developing new financial products, according to the needs of the moment, and prepared to understand and critically discuss the hypotheses and limitations of existing financial models. The Master is structured in three terms, two theoretical, with 120 hours of class each, and one pratical, working in the finance industry. The Master's responsability lies on the Academic Commission, consisting of professors Joan del Castillo, Jaume Llibre, Frederic Utzet, and Josep Vives who acts as co-ordinator, and the Advisory Council, consisting of Xavier Auguets (Caixa Catalunya), Antoni Giralt (Borsa de Barcelona), Pere Guinjoan (Caixa d'Estalvis i Pensions de Barcelona), Joan Sueiro (Banc Sabadell), and Jacint Boixasa (Caifor). A maximum of 20 students are admitted each year, and they find in the CRM the most advanced technological implements to follow the financial markets.

5.3.2 BARCELONA FINANCE SEMINAR

The *Institut d'Estudis Catalans*, through its Joan Sardà Chair and the CRM, has initiated, this year, the Barcelona Financial Seminar with the intention of establishing a solid relationship between quality research and the applications needed today by the leading businesses. This seminar, directed by professors Joan del Castillo of the UAB and David Nualart of the UB, is meant to be a forum of debate among professionals and faculty, from mathematicians to economists and engineers.

During the academic year 2001-2002 the Seminar has hosted the following talks:

Antoni Serra Ramoneda (President of Caixa Catalunya); *Reflexions sobre el sistema financer espanyol.*

Hans Föllmer (Humboldt Universität, Berlin); Financial risk and the role of mathematics: some recent developments beyond Black-Sholes.

Joan del Castillo (UAB); *Distribucions amb cues pesades en dades financeres*.

Antoni Espasa (Humboldt Universität, Berlin); Metodología moderna para el análisis de la coyuntura económica.

César Molinas (Chief European Debt Strategist, Merrill Lynch, London); ¿Hacia dónde van los mercados de renta fija?

Arturo Kohatsu (UPF); *Mesures de risc i anàlisi de sensibilitat*.

Jordi Caballé (UAB); *Primas de riesgo y preferencias de los inversores*.

Daniel Carrasco (Banc Sabadell); *La importancia de los indicadores económicos en los mercados financieros*.

Carlos Moreno (UPM); Valoración de opciones que dependen de varios factores.



Barcelona Finance seminar closing ceremony.

The Seminar ended with a round table titled *Business and University: Present and future*. The participants were:

Joan del Castillo (UAB); *Aprofitem el tercer cicle*.

Manuel Castellet (CRM); *Les dificultats d'una relació estable*.

David Nualart (UB); Matemàtiques i empresa.

The content of the Seminar talks have been collected in the monograph *Seminari de Finances de Barcelona*, published by the *Institut d'Estudis Catalans* in the series *Jornades Científiques*, number 16.

5.4 TALKS AND SEMINARS

5.4.1 ALGEBRA SEMINAR

Organised by the Universitat Autònoma de Barcelona.

Co-ordinated by Pere Ara.

M. Mathieu; *How to use spectrally bounded* operators to study non-associative structures in Banach algebras.

L. Angeleri Hügel; An introduction to Auslander-Reiten theory. G. Mezzetti; *Bilinear products with A.C.C. on annihilators.*

R. El Bashir; On cover classes in categories of modules.

P. Prihoda; Full affine semigroups and K_0 of semilocal rings.

B. H. Bowditch; *Ends of hyperbolic 3-mani-folds*.

L. Ribes; *Extensiones de grupos libres pro-p y puntos fijos de automorfismos.*

S. Cleary; *Thompson's grour F is not almost convex*.

E. Jesper; Some problems on units in integral group rings.

E. Jespers; Semigroups of skew type and their algebras.

L. Diracca; Descending series of modules.

G. Elek; Group algebras and continuous von Neumann regular rings.

5.4.2 ANALYSIS SEMINAR

Organised jointly by the *Universitat Autònoma de Barcelona* and the *Universitat de Barcelona*.

Co-ordinated by Joan Orobitg.

M. Miró; Ondetes respecte subgrups del grup lineal.

J. Orobitg; VMO functions with certain regularity properties.

S. Nivoche; About a conjecture of Zahariuta and a problem of Kolmogorov.

A. Nicolau; *Regularitat de mesures, entropia i llei del logaritme iterat.*

J. Ortega Cerdà; Conjectura de Fuglede.

K. Dyakonov; Funciones holomorfas, aplicaciones casi conformes y sus módulos: propiedades de tipo Lipschitz.

A. Volberg; Imbeddings of model spaces, two weight Hilbert transforms, and Bellman functions.

P. Tamrazov; Finely subharmonic and finely holomorphic functions and related topics.

A. Hartmann; *Kernels of Toeplitz operators via extremal functions*.

N. Marco; *Intepolating and sampling sequences for entire functions.*

J. J. Donaire; *Funcions univalents en alguns espais Moebius-invariants*.

H. Pajot; Menger curvature and the geometric traveling salesman problem.

D. Galé; Semigrupos en análisis.

J. Pau; Descomposicions atòmiques i conjunts de determinació.

N. Lindholm; *Sampling in spaces of entire functions and local dimension*.

A. Volberg; Compact composition operators on Dirichlet space and Cotlar's lemma.

O. Dragicevic; *Estimates of some Riesz transforms*.

K. Fedorovski; Approximation by polyanalytic polynomials and related topics. G. David; *Measures with finite Menger curvature*.

A. Borichev; On the growth of iterations of diffeomorphisms of the interval.

J. J. Carmona; L'índex d'una corba i el teorema de Green.

J. Verdera; Analytic capacity, bilipschitz mappings and Cantor sets.

J. Bruna; Subespais densos de L^1 generats per translacions discretes.

R. Mortini; *Asymptotic interpolating sequences*.

A. García; Algunas observaciones sobre regularidad de límites inductivos y completez local.

K. Dyakonov; *Los puntos extremales en espacios de polinomios.*

A. Alexandrov; A class of interpolating Blaschke products and best approximation in L_p for p < 1.

D. Suárez; Abelianización de álgebras de Toeplitz sobre el espacio de Bergman.

A. Volberg; Removable singularities of Lipschitz harmonic functions and, an analog of Vitushkin's conjecture for higher dimensions.



5.4.3 GEOMETRY SEMINAR

Organised by the Universitat Autònoma de Barcelona.

Co-ordinated by Marcel Nicolau.

F. Loray; Construction of stably chaotic rational vector fields on $\mathbb{C}P^n$

C. Cosin; Un problema de Plateau en el infinito para superficies de curvatura total finita.

G. Casale; Classification of D-groupoids in dimension 1.

J. F. Bobadilla; Comportamientos en el infinito y espacios de moduli de polinomios en dos variables.

L. Teyssier; Homological equation for a saddle-node singularity at $0 \in C^2$. A geometrical approach.

N. Dutertre; Una fórmula de tipo Gauss-Bonnet para las fibras polinomiales no compactas.

G. Cairns; On thrackles and musquashes.

J. Ribón; Funciones subarmónicas y convergencia de objetos formales.

G. Solanes; *Integrals de curvatura mitja a l'espai hiperbòlic*.

A. Bodin; Una versión global del teorema μ -constante de Lê-Ramanujam.

A. Díaz Miranda; *Grupos de estabilidad de sistemas de Pfaff.*

J. Girbau; Varietats de Riemann homogènies de dimensió tres.

5.4.4 LOGIC SEMINAR

Organised by Joan Bagaria (ICREA-UB), Enrique Casanovas (UB) and Rafael Farré (UPC).

E. Casanovas; *Las raíces libres del grafo completo*.

D. Asperó; *More on a convenient property for* $[\gamma]^{\aleph_0}$.

X. Caicedo; Conectivos implícitos del cálculo intuicionista.

X. Caicedo; Cuantificadores y juegos de información imperfecta.

P. O. Gorman; *Mathematics, logic and infinity: Poincaré and Wittgenstein.*

J. Flum; Decidir y contar.

E. Casanovas; *Observaciones sobre secuencias indiscenibles*.

P. Koepke; *The consistency strength of a mutual stationarity property.*

A. Atserias; Unsatisfiable random formulas are hard to certify.

D. Asperó; Bounded Martin's maximum, the dominating number and the size of the continuum.

N. Asher; *Dynamic semantics and discourse interpretation*.

R. Zach; Logic and metalogic in Hilbert's school.

A. Onshuus; *Propiedades y consecuencias de thorn-forking.*

E. Casanovas; La derivada de Newelski.

F. Bou; *Definibilidad en el lenguaje intuicionista*.

R. Peláez; Clasificación elemental de los grupos abelianos.

J. Bagaria; Axioms of generic absoluteness.

5.4.5 PROBABILITY AND STATISTICS SEMINAR

Organised by the Universitat Autònoma de Barcelona.

Co-ordinated by Josep Lluís Solé.

J. M. Bardet; Simulació de sèries de llarga memòria.

M. Jolis; *Un espai per la integral múltiple de Stratonovich*.

S. Tindel; *Exponents de Lyapunov per a una EDPS parabòlica*.

M. Eddahbi; *Limit theorems for occupation times of stables processes in some functional spaces.*

A. Alabert; Convergència d'esperances condicionades en llei i en L^p.

5.4.6 DYNAMICAL SYSTEMS SEMINAR

Organised by the Universitat Autònoma de Barcelona.

Co-ordinated by Lluís Alsedà and Armengol Gasull.

T. Martínez-Seara; Introducció a la teoria de la resurgència d'Ecalle. Aplicació a alguns problemes d'equacions diferencials.

J. C. Tatjer; Introducció a l'atractor d'Henon.

H. Giacomini; *Quadratic systems with algebraic limit cycles and Darboux integrability.*

L. Snoha; Topological entropy of Devaney chaotic maps.

V. Jiménez; La propiedad estroboscópica en dinámica topológica.

M. Corbera; Periodic orbits for the collinear restricted three body problem.

J. R. Stirling i C. Torrents; *Modeling nonlinear phenomena in sport*.

M. Zakynthinaki; Stability in sport.

A. Delshams; *Òrbites bi-asimptòtiques de billars dins d'el·lipsoides perturbats.*

J. Dutta; Nonsmooth optimization, generalized convexity and related topics.

J. Llibre; Sobre *alguns problemes oberts de sistemes dinàmics.*

J. A. Rodríguez; *Introducción al atractor de Shilnikov*.

Ll. Alsedà; *Transitivity and dense periodicity for graph maps*.

O. Yu. Koltsova; *Multi-round homoclinic and periodic orbits in families of Hamiltonian systems with saddle-centers.*

E. Ponce; Generación de osciladores de dimensión arbitraria a partir de sistemas controlables.

C. Simó; L'equació de Hill amb coeficients periòdics i quasiperiòdics: resonàncies, desplegaments i bifurcacions.

J. Llibre; Introducció a l'atractor de Lorenz.

C. Bodelon; *Estudis de dinàmica no lineal a la neurociència*.

A. Guillamon; *Mathematical models of visual cortex*.

M. Chamberland; A dynamical systems approach to the 3x+1 problem.

M. Chamberland; *Flows on Compact, two-dimensional manifolds*.

M. Chamberland; *Jacobian conjectures and unipotent maps.*

J. Villadelprat; Sobre el diagrama de bifurcació de la funció de període dels centres quadràtics.

M. Zhitomirskii; *Classification of curves and local contact algebra*.

M. Zhitomirskii; *The homotopy method*.

A. Teruel; Una extensión de ciertos resultados sobre la dinámica en un entorno de una órbita homoclina de Shilnikov.

J. C. Artés; Some applications of the T-domitants in the qualitative analysis of polynomial differential systems.

Ch. Li; A uniform proof on weak Hilbert's 16th problem for n=2.

J. Villadelprat; *La funció de període dels centres quadràtics: desenvolupament asimptòtic i bifurcacions.*

5.4.7 TOPOLOGY SEMINAR

Organised jointly by the *Universitat Autònoma de Barcelona* and the *Universitat de Barcelona*.

Co-ordinated by J. Aguadé and C. Broto.

A. Ruiz; Alperin's fusion theorem for saturated fusion systems.

G. Collinet; Blocks theory.

C. Broto; The concept of p-local finite group (I).

R. Flores; *The concept of p-local finite group* (II).

B. Chorny; Localization of diagrams of spaces.

R. Flores; A topological characterization of the p-local finite groups.

K. Andersen; *Some exotic examples of p-local finite groups*.

A. Troesch; *Some* Ext-*groups in functor cate-gories*.

C. Broto; *p*-local finite groups and beyond.

J. Greenlees; Duality in algebra and topology.

J.-P. Hoffmann; *Induction theory for compact Lie groups*.

P. E. Parent; *Emergence of the Witt group in the cellular lattice of rational spaces.*

S. Dourlens; *Poincaré duality quivers*.

N. Kitchloo; On Morava K-theory of spaces related to BO.

D. Notbohm; *Finite loop spaces are mani-folds?*

R. J. Flores; Nullification functors and the homotopy type of BG.

N. P. Strickland; *Equivariant formal groups*.

A. Przezdziecki; On the Kan-Thurston theorem. A model category structure on the category of topogenic groups and groupoids.

E. Dror-Farjoun; *A generalized Seifert-van Kampen theorem.*

D. Chataur; *Operadic interpretation of higher* cohomological operations.

T. Beke; *Higher Cech theory*.

J. Scherer; A new old group completion theorem.

Y. Félix; On Chas-Sullivan string homotopy.

J. Møller; 2-compact groups and a little more.

J. Smrekar; Function spaces and CW-homo-topy type.

M. Vigué; Relations between the cohomology of a space and the cohomology of its free loop space.

A. Libman; Normaliser decompositions.

5.4.8 OTHER TALKS

G. Cohen; Codes for collusion-secure fingerprinting.

D. Gavilán; *Remote sensing: Presenting a Java application to process and compress images.*

J. Herrera; Tècniques de protecció del copyright per a imatges.

A. Sánchez; Models de Markov ocults i aplicacions en biologia computacional. W. E. Saris; *Detection and correction for measurement errors in social science research.*

D. Labutin; *Potencial estimate for large solutions of semi-liniar elliptic equations.*

J. Guàrdia; Construcció de corbes el·líptiques CM aplicables en criptografia. E. Nart; Construcció CM de corbes de gènere 2 aplicables en criptografia.

J. Guàrdia; Aplicació dels Thetanullwerte Jacobians a la construcció de corbes hiperel·líptiques per a la criptografia.

J. González; Superfícies abelianes modulars.

6. PUBLICATIONS

During the year 2002 the CRM has continued its three series of publications, *Preprints, Quaderns,* and *Conferencies*.

6.1 PREPRINTS

During this year 30 preprints have been published:

Bifurcation of limit cycles from two families of centers. B. Coll, A. Gasull, R. Prohens (n. 491)

Computation of Milnor numbers and critical values in affine space and at infinity. A. Bo-din (n. 492).

Potential estimates for large solutions of semilinear elliptic equations. D. A. Labutin (n. 493).

Equivalence and Hölder-Sobolev regularity of solutions for a class of non autonomous stochastic partial differential equations. M. Sanz-Solé, P.-A. Vuillermot (n. 494).

Une formule pour la cohomologie de foncteurs composés. A. Troesch (n. 495). *Geometrical and topological properties of polynomial fibres*. N. Dutertre (n. 496).

Comparaison des modules d'extensions dans des catégories de foncteurs. A. Troesch (n. 497).

Poincaré duality quivers. S. Dourlens (n. 498).

Rational extended Mackey functors for the circle group. J. P. C. Greenlees, J.-Ph. Hoffmann (n. 499).

Relative group completions. C. Casacuberta, A. Descheemaeker (n. 500).

Non reality and non connectivity of complex polynomials. A. Bodin (n. 501).

Regularity and asymptotic behaviour of the local time for the d-dimensional fractional Brownian motion with N-parameters. M. Eddahbi, R. Lacayo, J. L. Solé, C. A. Tudor, J. Vives (n. 502).

Analysis of greedy algorithms on graphs with bounded degrees. N. C. Wormald (n. 503).

A support problem for the intermediate jacobians of l-adic representations. G. Banaszak, W. Gajda, P. Krasoń (n. 504).

Chaotic expansion and smoothness of some functionals of the fractional Brownian motion. M. Eddahbi, J. Vives (n. 505).



How (non-)unique is the choice of cofibrations? T. Beke (n. 506).

Operadic description of Steenrod operations. D. Chataur, M. Livernet (n. 507).

Invariant algebraic curves of large degree for quadratic systems. C. Christopher, J. Llibre, G. Świrszcz (n. 508).

A factorization theorem for Haken manifolds. P. Derbez (n. 509).

Asymptotic behaviour for occupation times of certain self–similar processes. M. Eddahbi (n. 510).

An example of a cubic Liénard system with linear damping having invariant algebraic curves of arbitrary degree. J. Llibre, G. Świrszcz (n. 511).

A Stroock formula for a certain class of Lévy processes. M. Eddahbi, J. L. Solé, J. Vives (n. 512).

A class of interpolating Blaschke products and best approximation in L^p for p < 1. A. B. Aleksandrov (n. 513).

Ext and inverse limits. J. Trlifaj (n. 514).

Periodic travelling waves in nonlinear reaction-diffusion equations via multiple Hopf bifurcation. V. Mañosa (n. 515).

Operadic Hochschild chain complex and free loop spaces. D. Chataur, J.-Cl. Thomas (n. 516).

Factorization of polynomials with estimates of norms. A. Volberg (n. 517).

Regular inductive limits of locally complete spaces. A. García (n. 518).

The Tb-theorem on non-homogeneous spaces that proves a conjecture of Vitushkins. F. Nazarov, S. Treil, A. Volberg (n. 519).

Heating of the Beurling operator and the estimates of its norm. F. Nazarov, A. Volberg (n. 520).

6.2 QUADERNS

They compile the content of specialised activities. The following 3 issues have been published:

Advanced Course on Mathematical Finance: Further models (I). Editor: Joan del Castillo (n. 23).

Advanced Course on Mathematical Finance: Further models (II). Editor: Joan del Castillo (n. 24).

Advanced Course on Geometric 3-Manifolds. Editor: Joan Porti (n. 25).

6.3 CONFERÈNCIES

The sixth volume of this series has been published. It compiles the extended abstracts of the lectures and seminars given at the CRM during the year 2001.

6.4 ADVANCED COURSES IN MATHEMATICS CRM BARCELONA

The volumes of this series published by the Swiss publishing company Birkhäuser-Verlag, cover the content of some of the advanced courses taught by distinguished specialists at the CRM, based on the notes handed out to the students at the beginning of the course, which are later reworked by the authors. They are especially addressed to advanced doctoral and young post-doctoral students, and completely elucidate their content, with the necessary preliminaries, definitions and detailed proofs.

From the September 2001 Advanced Course *on Algebraic Quantum Groups*, the second volume of the series, bearing the same title and authored by K. Brown and K. Goodearl, has been published this year 2002.



Three more volumes, currently in printing, will be published in 2003.

Symplectic Geometry of Integrable Hamiltonian Systems, by M. Audin, A. Cannas da Silva and E. Lerman.

Global Riemannian Geometry: curvature and topology, by S. Markvorsen and M. Min-Oo.

Proper Group Actions and the Baum-Connes Conjecture, by G. Mislin and A.Valette.

6.5 OTHER PUBLICATIONS

The book *Cohomological Methods in Homotopy Theory*, edited by J. Aguadé, C. Broto and C. Casacuberta, and published by Birkhäuser-Verlag in the series *Progress in Mathematics* (n. 196) contains a collection of articles summarising together the state of knowledge in a broad portion of modern homotopy theory. These articles were assembled during 1998 and 1999, on the occasion of an emphasis semester organised by the CRM and the 1998 Barcelona Conference on Algebraic Topology (BCAT).

7. THE EUROPEAN FRAMEWORK

7.1 ERCOM

ERCOM (European Research Centres on Mathematics) is a committee of the European Mathematical Society consisting of 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 that cover Mathematical Sciences broadly are eligible for representation in ERCOM.

The purposes of ERCOM are:

• To constitute a forum for communication and exchange of information and to foster collaboration and co-ordination among the centres themselves and between the centres and the EMS.

• To promote advanced research training on a European level.

• To advise the Executive Committee of the EMS on matters related to activities of the centres.

• To contribute to make the EMS more visible.

• To cultivate contacts with similar research centres within and outside Europe.

The Chair of ERCOM is proposed by the Committee and appointed by the Executive Committee of the EMS for a period of 4 years (to be renewed for 2 more years).

The *Centre de Recerca Matemàtica* is member of ERCOM from its foundation.

From 2002 the Director of the CRM, Manuel Castellet is Chairman of ERCOM.

The annual meeting of ERCOM was held March 9 and 10 in Warsaw, at the Stefan Banach International Mathematical Center, were the Directors and Administrators of ER-COM, had separated and joint meetings.

The 2003 meeting will be held in Vienna, at the Erwing Schrödinger International Institute for Mathematical Physics, on March 15 and 16. The ESI will be celebrating the 10th anniversary of its foundation.

Web: http://www.crm.es/ercom

7.2 EPDI

The CRM is member of EPDI (European Post-doctoral Institute for the Mathematical Sciences) since December 2000. The EPDI is a network of 9 European research institutes, which are: the Institut des Hautes Études Scientifiques (IHES) in Bures (which was the promoter and whose director J.-P. Bourguignon co-ordinates it), 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 Institut Mittag-Leffler in Djursholm, the Banach Center in Warsaw, the Erwin Schrödinger Institut in Vienna, the Forschungsinstitut für Mathematik (FIM) in Zurich, and the CRM.

Every year, the EPDI offers two-year Post-doctoral fellowships in Mathematics (pure and applied) and in Mathematical Physics to young Europeans.

In 2001 one of the fellowships was awarded to Pierre Derbez who has been working at the CRM from September 2001 to August 2002 in *Three-dimensional manifolds and degree one maps*. The scientist in charge was Joan Porti, from the UAB.

The 2002 call will be awarded at the meeting of the Scientific Committee in the month of February.

Web: http://seven.ihes.fr/EPDI/index.html

7.3 THE CRM IN THE 5th FRAMEWORK PROGRAMME OF THE EUROPEAN UNION



Both the Centre de Recerca Matemàtica and its Director have played an active role in the 5th Framework Programme of the European

Union, in particular in the Improving Human Research Potential programme.

During the period 1999-2002, the CRM has hosted 6 post-doctoral Marie Curie fellows in the topics of Topology, Geometry, Analysis and Dynamical Systems. The names of the fellows are:

FX- Dehon	(Topology)
M. Cuvilliez	(Topology)
N. Dutertre	(Geometry)
G. Świrczsz	(Dynamical Systems)
A. Bodin	(Analysis)
D. Chataur	(Topology)

The CRM has submitted a total of 15 proposals to conferences and advanced courses through the subprogramme High-level Scientific Conferences, 14 of which were awarded by the European Commission, making possible the organisation of 5 EuroConferences, 2 EuroConferences PhD and 7 Euro Advanced Courses in research topics such as Complex Dynamics, Logic, Non-commutative Algebra, Algebraic Topology, Symplectic Geometry, Riemannian Geometry, Modular Forms, Graphs and Combinatorics, Stochastic Analysis, Mathematical Finance, Algebraic Geometry and Low-dimensional Topology.

In the 1999 call for the constitution of Research Training Networks, the Modern Homotopy Theory Network, co-ordinated by John Hubbuck (University of Aberdeen) was approved. The CRM participates in the Network through the Algebraic Topology Group and a subnode created at the Universidad de Málaga.

In the year 2000, the Algebraic Topology Group, through its research project on Cohomological and Group Theory Methods in Topology was designated by the European Commission a Marie Curie Training Site for the period from October 2000 to October 2004, thereby recognising its capacity for training doctoral students. One expects that within this period 10 to 12 doctoral students from several European universities will complete training stays at the CRM.

The director of the CRM has taken part in several evaluation committees of subprogrammes of the EC: Marie Curie Individual Fellowships, High-level Scientific Conferences, and the Descartes Prize.

8. THE ALGEBRAIC TOPOLOGY GROUP



The Barcelona Algebraic Group was declared in 1995 a *Consolidated Research Group* by the Generalitat de Catalunya. Headed by Jaume Aguadé (UAB) it belon-

ged during the period 2000 – 2002 to the European Research Training Network *Modern Homotopy Theory*, co-ordinated by J. Hubbuck (University of Aberdeen). In the year 2000 call of the European Union it was designated a Marie Curie Training Site. Among the activities of the *Barcelona Algebraic Topology Group* during this year 2002 one should point out:

• The organisation of the quadrennial conference 2002 *Barcelona Conference on Algebraic Topology* (BCAT).

• The organisation of the advanced course *Geometric 3- Manifolds*.

• The announcement of a doctoral fellowship, awarded to María Dolores Morales (*Universidad de Granada*).

• The admission of post-doctoral fellows from the Modern Homotopy Theory Network.

A. Descheemaeker	Katholieke Universiteit Leuven
K. Andersen	Universitet Kobenhavn
T. Beke	University of Michigan

• The hosting of doctoral students in the framework of the Marie Curie Training Site.

- B. Chorny Hebrew University of Jerusalem
- G. Collinet École Polytechnique, Palaiseau
- A. Troesch Université de Paris XIII
- J.-Ph. Hoffmann Universität Göttingen
- S. Dourlens Université de Nice
- J. Smrekar Univerza v Ljubljani

Web: http://www.mat.uab.es/topalg/page.htm

9. FERRAN SUNYER I BALAGUER FOUNDATION PRIZE

In 2002 the Institut d'Estudis Catalans and the Ferran Sunyer i Balaguer Foundation announced the International Ferran Sunyer i Balaguer Prize for the eleventh time. The prize is awarded to a monograph which updates the progress in research in a mathematical area which has recently been developed.

The prize consists of 10,000 euros and the winning monograph is published by Birkhäuser Verlag in the Progress in Mathematics series.

In the announcement of the year 2001, 7 monographs by authors from different countries were submitted. The Scientific Committee consisting of Hyman Bass (University of Michigan), Antonio Córdoba (UAM), Warren Dicks (UAB), Paul Malliavin (Université Paris VI) and Alan Weinstein (University of California at Berkeley) recommended that the Foundation should award the prize to two monographs:



Ferran Sunyer i Balaguer

Subgroup growth

by

A. Lubotzky, Hebrew University of Jerusalem Dan Segal, All Souls College, Oxford.

Automorphic pseudodifferential analysis and higher-level weyl calculi

by

A. Unterberger, Université de Reims. (Progress in Mathematics, n. 209, Birkhäuser-Verlag.)

Web: http://www.crm.es/info/ffsb.htm

10. INSTITUTIONAL FUNDING

10.1 VISITING PROFESSORS (MECyD, DURSI)

E. Jespers	02.04.02 - 30.06.02
A. Alexandrov	01.06.02 - 30.11.02
Ch. Li	01.09.02 - 31.08.03
E. Dror-Farjoun	01.10.02 - 31.01.03
J. Trlifaj	01.10.02 - 31.01.03
A. Volberg	01.11.02 - 31.04.03

10.2 POST-DOCTORALS FELLOWSSHIPS (MECyD, DURSI)

F. Loray	02.01.02 - 20.12.02
M. Eddahbi	04.03.02 - 31.08.03
S. lai	01.09.02 - 31.08.03
G. Świrszcz	01.06.02 - 30.11.03

10.3 MARIE CURIE INDIVIDUAL FELLOWSHIPS (EC)

A. Bodin	01.11.01 - 31.08.02
D. Chataur	01.11.01 - 31.10.03
M. Cuvilliez	01.01.01 - 31.08.02
N. Dutertre	01.10.00 - 31.08.02
G. Świrszcz	01.11.01 - 31.10.02

10.4 FELLOWSHIPS OF THE NETWORK MODERN HOMOTOPY THEORY (EC)

K. Andersen	01.12.01 - 30.08.02
A. Descheemaker	01.01.01 - 31.08.02
T. Beke	01.09.02 - 31.01.03

10.5 EPDI FELLOWSHIPS

P. Derbez

01.10.01 - 30.09.02

10.6 MARIE CURIE TRAINING SITE (EC)

B. Chorny	01.09.01 - 28.02.02
G. Collinet	01.10.01 - 31.01.02
A. Troesch	01.02.02 - 30.04.02
JPh. Hoffmann	01.03.02 - 31.07.02
S. Dourlens	01.04.02 - 31.07.02
J. Smrekar	02.09.02 - 31.08.03

10.7 ORGANISATION OF CONFERENCES AND ADVANCED COURSES

Stochastic Inequalities and their Applications, (EC, MCyT, DURSI).

Mathematical Finance: Further models, (EC, MCyT, DURSI, UAB).

2002 Barcelona Conference on Algebraic Topology, (EC, MCyT, DURSI, UAB).

Modular Curves and Abelian Varieties, (EC, MCyT, DURSI, UPC, UAB).

Geometric 3-Manifolds, (EC, MCyT, DURSI, UAB).

Séminaire Méditerranéen d'Algèbre et Topologie (DURSI, UAB).

10. INSTITUTIONAL FUNDING



11. BUDGET

11.1 FUNDING SOURCES

DURSI (subsidy)	120.200€
MECyD	106.000 €
МСуТ	23.187€
DURSI (applications)	23.200€
EC	521.199€
UAB (facilities)	22.000€
UAB (activities)	2.254 €
UPC (activities)	1.202 €
Foundation FSB	12.000 €
Registration fees	27.400€
Remainder year 2001	46.033€
Total	904.675€

11.2 EXPENDITURE

Visitors	136.395€
Post-doctoral fellows	271.132€
Graduate students	26.300€
Conferences and Courses	214.525€
Travels of visitors	12.513 €
Maintenance	22.000€
Long-term material	57.910€
Day-to-day material	2.570€
Secretariat	107.987 €
Director	11.000€
Publications	2.717€
Miscellaneous	11.254 €
Remainder	28.372 €
Total	904.675€



THE FUTURE QUADRIENNIUM 2003-2006

12. THE CENTRE DE RECERCA MATEMÀTICA CONSORTIUM

Concept

The organisations that finance research tend, quite legitimately, to give priority to vertical actions: projects, infrastructure, research fellowships, etc. These actions are assigned directly to research groups, consolidated or not, but always groups that have specific research projects.

Catalonia suffers from a shortage of horizontal actions that support the research of several groups in the same field. Such actions are especially important in mathematics for two reasons: firstly, because of the oneness of the field and the substantial interconnections between its different branches, and, secondly, because concentrated human contact to compare ideas and methods is one of the key components of scientific production.

The Centre de Recerca Matemàtica is, in essence, a horizontal infrastructure that gives support to all mathematical research groups in Catalonia, and encourages pursuit of new emerging lines of research. What is proposed in the following is a restructuring of the present arrangement which will allow it to achieve new objectives and function more proficiently.

Objectives

• To achieve more stability in the research programmes.

• To acquire the best post-doctoral fellows on the basis of the competitive programmes of various administrations and agencies.

• To help push forward the best research projects of Catalan researchers.

• To establish mechanisms to guarantee a more efficient service for all the Catalan mathematicians.

• To enable the CRM to take a new step towards being competitive with the best

European research centres and those of scientifically developed countries of a comparable level.

Structure

By an agreement between the DURSI and the IEC, signed on July 31, 2001, the Government of Catalonia, in the framework of the III Research Plan for Catalonia, created the "new" *Centre de Recerca Matemàtica* (CRM), as a consortium between the Catalan Government and the *Institut d'Estudis Catalans*, with its own legal status. (Government agreement of 9.7.2002, Resolution of 30.7.2002, DOGC of 6.8.2002.)

The CRM will continue to maintain its current connections with the UAB, ERCOM and the EPDI, and is permitted to sign cooperation agreements with other Catalan universities, mainly the *Universitat de Barcelona* and the *Universitat Politècnica de Catalunya*, if they so desire, in order to facilitate greater collaboration.

Organisation

The new statutes of the CRM provide for the following organs of government:

• The Governing Board, composed of the Minister of the DURSI, who acts as president, the President of the IEC, three members designated by the Government and three by the IEC.

• The Director, who is appointed, and can be removed, by the Governing Board.

• The Scientific Advisory Board, whose members are proposed by the Director and approved by the Governing Board.

- Administrative support
 - Technical and administrative support.
 - Computer system support.
 - Economic and personnel administrative support.

13. SCIENTIFIC ACTIVITIES

Besides the activities carried out in the present, the CRM wishes to implement Research Programmes with the following details:

13.1 CRM RESEARCH PROGRAMMES

On November 22, 2002 the CRM Governing Board passed a resolution consisting on a quadrennial strategic plan that includes two Research Programmes per year, together with other complementary activities.

Goal

To foster, during every year, the work of two outstanding research groups from Catalan institutions, by hosting visitors and post-doctoral fellows.

Scientific research staff

- 1 full time local researcher; eventually, 2 one semester each.
- 1 full time visiting researcher; eventually, 2 one semester each.
- 2 post-doctoral fellows.
- 24 months of visiting researchers for periods of 1 to 3 months.
- Other local or visiting researchers.

Activities

- Research.
- Seminars.
- 1 conference or workshop.
- 1 advanced intensive course at a doctoral or recent post-doctoral level.
- 1 talks series for undergraduate students.

The annual Research Programmes will start in the academic year 2003-2004,

and will be open to public competition with at least one and a half year's notice. Each Research Programme must be approved by the Governing Board of the CRM, at the proposal of the Director, having been informed by the Scientific Advisory Board who will evaluate the applications received.

13.2 OTHER COMPLEMENTARY ACTIVITIES OF THE CRM

• Research visitors.

The equivalent of two researchers per year (a total of 24 months) assigned for periods of 1 to 6 months from fields other than those from the programmes of the year, proposed to the Director by mathematicians from Catalan academic institutions.

- Post-doctoral fellowships supported by external organisations. (Mainly by EC and MECyD).
- Research fellowships for the emerging fields. (To be defined by the Scientific Advisory Board).

• Conferences and advanced courses supported by external organisations.

Thinking in terms of the research staff, the previous project implies that the CRM has to have the necessary funds available to host 8 senior researchers and 4 postdoctoral fellows every year. Together with the two researchers from Catalan institutions, who direct the research programmes, they will form the annual research staff at the CRM.

13.3 ADVANCED COURSES IN MATHEMATICS CRM BARCELONA

The Swiss publishing house Birkhäuser Verlag and the *Centre de Recerca Matemàtica* signed an agreement in the year 2001 for the publication of the series *Advanced Courses in Mathematics CRM Barcelona*. This is a series of books, of high quality format and printing edition, which comprises the contents of some of the advanced courses given at the CRM by outstanding experts. These are prepared from prior notes that were distributed to the participants and later rewritten by the authors. The books, especially addressed to advanced doctoral as well as young post-doctoral students, develop their material in a complete form. Manuel Castellet acts as managing editor of this series.

Two of these issues have already been published, another two are in the editing process, and it is anticipated that there will be a stable production of two volumes per year.

13.4 THE PRIORITY THEMATIC AREAS IN THE EU 6th FRAMEWORK PROGRAMME

The European Union has defined on its 6th Framework Programme 7 priority thematic areas of research:

- Genomics and biotechnology of health.
- Information Society technologies.
- Nanotechnologies and nanosciences.
- Aeronautics and space.
- Food quality and safety.
- Sustainable development, global change and ecosystems.
- Citizens and governance in a knowledgebased society.

Mathematics is a fundamental part of all these thematic areas, but especially in the first four areas. In the same way that Catalan mathematicians 20 years ago made a substantial quality leap forward taking up the leading research tendencies, it is necessary that we now take up the new research lines which emerge from these priority thematic areas.

The CRM has the intention of elaborating "state of the art" reports for three of these areas, discover young researchers interested in these areas, and facilitate their participation in activities carried out around the world, but mainly in the ERCOM centres, with the aim of opening new lines of research within the three selected fields.

13.5 ENROLMENT OF ICREA VISITING RESEARCHERS

To benefit from the call by ICREA, the CRM will, at the suggestion of mathematicians of Catalan institutions, and after consulting the Scientific Advisory Board, systematically present proposals of research visitors who undertake to work at the CRM for periods of 2 to 4 months during three academic years.

Only high level researchers, who can give advanced specialized courses of interest to the mathematical community and/or introduce new methods and techniques, will be presented as candidates.

13. SCIENTIFIC ACTIVITIES

13.6 MASTER'S COURSE IN MATHEMATICAL FINANCE

The sixth edition of the Master's course in Mathematical Finance, initiated in the academic year 2003-2004, and jointly organised with the Department of Mathematics of the UAB, will be sponsored by the Barcelona stock exchange. The consolidation of this master's will require the participation of researchers in the area from all Catalan universities.

Every year, 20 students are admitted to this master (which is highly demanding and of a high scientific level) to attend theoretical and practical courses for two periods of four months. Those who pass the course proceed to a third four-month period of training in a financial company.

13.7 MASTER'S COURSE IN MATHEMATICAL MODELLING

Because of the importance that mathematics has acquired in industrial applications, the CRM will investigate the possibility of establishing a Master's course aimed at those graduates who wish to study mathematical modelling more profoundly. The programme would be modelled on the Master's course in Mathematical Finance, with a plan to involve various companies and industries who would provide practical experience for students who pass the theoretical part. This Master's course could be organised jointly with the *Universitat Politècnica de Catalunya*.

14. SCIENTIFIC PROGRAMME FOR THE YEAR 2003

The CRM Research Programmes will start in the academic year 2003-2004, with an annual programme dedicated to Set Theory, co-ordinated by J. Bagaria (ICREA-UB) and S. Todorcevic (CNRS, Paris).

The planning made and the commitments adquired for the year 2003, all prior to the creation of the Consortium, are reflected in the large number of visiting researchers, either internationally recognized or in post-doctoral training.

The CRM has begun organising three international conferences, two advanced courses at the doctoral or recent post-doctoral level, one workshop, the Master's course in Mathematical Finance, the Ferran Sunyer i Balaguer lectures, and the publication of three new volumes in the *Advanced Courses in Mathematics CRM Barcelona* series of Birkhäuser Verlag.

14.1 RESEARCH PROGRAMME ON SET THEORY

Organisers

Local	Joan Bagaria (ICREA and UB).
Visitor	Stevo Todorcevic (CNRS, Paris).

Main research topics

- Ramsey methods in functional analysis.
- The continuum problem.

Other research topics

• Applications of combinatorial set theory and forcing to general topology and Boolean algebras.

- Inner model theory for large cardinals.
- Generic absoluteness and its consequences in combinatorics and descriptive set theory.
- Current topics in descriptive set theory.
- Current topics in combinatorial set theory.

Visiting researchers

Spiros Argyros University of Athens

David Asperó Institut für Formale Logik, Wien

Tomek Bartoszynski Boise State University

Andreas Blass University of Michigan

Roger Bosch Universidad de Oviedo

Patrick Dehornoy Université de Caen

Mathew Foreman University of California at Irvine

Sy Friedman Institut für Formale Logik, Wien

James Hirschorn Institut für Formale Logik, Wien

Thomas Jech Pennsylvania State University

Alexander Kechris California Institute of Technology

Peter Koepke Universität Bonn Paul Larson The Fields Institute Jordi López

Jordi López Université Denis-Diderot, Paris

Jimena Llopis Universitat Pompeu Fabra, Barcelona

Adrian Mathias Université de La Réunion Carlos di Prisco Instituto Venezolano de Investigaciones Científicas

Stevo Todorcevic CNRS, Paris

W. Hugh Woodin University of California at Berkeley

Jindra Zapletal University of Florida

Activities

Seminars

Two weekly seminars on:

- Set Theory (co-ordinated by J. Bagaria).
- Combinatorics and its applicacions to Analysis (co-ordinated by S. Todorcevic).

Conference

Barcelona Conference on Set Theory September 16 to 20, 2003

More information: http://www.crm.es/set-theory

Advanced Course

Ramsey Methods in Analysis January, 21 to 30, 2004

More information: http://www.crm.es/Ram-seyMethods

Workshop

Strong axioms on Set Theory and the Continuum problem June 2004



14. SCIENTIFIC PROGRAMME FOR THE YEAR 2003

14.2 OTHER RESEARCH VISITORS

Research visitors

Peking University	Dynamical Systems
Università di Padova	Algebra
Steklov Institute	Analysis
Universidade de São Paulo	Logic
UNAM, México	Topology
Syddansk Universitet	Algebra
Universidad de Granada	Algebra
Université de Rennes	Algebra
Moscow State Univ.	Analysis
Universidad de Cádiz	Algebra
Steklov Institute	Topology
Université de Lille	Geometry
Université Paris XIII	Probability
UC Santa Barbara	Algebra
Tufts University	Dynamical Systems
Michigan State University	Analysis
Hebrew University of Jerusalem	Algebraic Topology
Pennsylvania State University	Algebra
	Peking University Università di Padova Steklov Institute Universidade de São Paulo UNAM, México Syddansk Universitet Universidad de Granada Universidad de Granada Université de Rennes Moscow State Univ. Universidad de Cádiz Steklov Institute Université de Lille Université de Lille Université Paris XIII UC Santa Barbara Tufts University Michigan State University Hebrew University of Jerusalem Pennsylvania State University

Post-doctoral fellows

D. Chataur	CRM	Algebraic Topology
G. Świrszcz	Uniwersytet Warszawski	Dynamical Systems
M. Eddahbi	Université Cadi Ayyad	Stochastic Analysis
T. Beke	University of Michigan	AlgebraicTopology
S. lai	Meiji University, Kawasaki	Commutative Algebra
J. Stirling	UPC	Applied Mathematics
F. Buica	Babes-Bobylai University	Dynamical Systems
A. Martino	University of Southampton	Algebra
L. Dieulefait	Université Paris XIII	Numbers Theory
C. Busch	Katholische Universität Eichstaett – Ingolstadt	Algebraic Topology

14.3 OTHER CONFERENCES AND ADVANCED COURSES

Complex Systems and Computer Science in Sport (conference)

Co-ordinator: Amadeu Delshams, UPC. Collaboration with the INEFC 14.05.03 – 18.05.03 More information: http://www-ma1.upc.es/ comcom/

Advanced Course on Polynomial Identity Rings

Co-ordinator: Ferran Cedó, UAB 01.07.03 – 10.07.03 More informatio: http://www.crm.es/Pl-rings

The Barcelona Conference on Asymptotic Statistics

Co-ordinator: Vladimir Zaiats, Universitat de Vic 02.09.03 – 06.09.03

More information: http://www.cr.es/bas2003

14.4 MASTER COURSE

Mathematical Finance (6th edition) Organised jointly with the Department of Mathematics of the UAB

14.5 LECTURES FERRAN SUNYER I BALAGUER

Matemàtiques del segle XXI: dels fonaments a la tecnologia

Series of 6 lectures especially devoted to undergraduate students in Mathematics and to secondary school teachers, co-ordinated by Manuel Castellet.

Speakers: Joan Bagaria (ICREA–UB), Manuel Castellet (UAB–CRM), Xavier Messeguer (UPC), Carles Puente (Fractus S.A.), James Stirling (CRM), Sebastià Xambó (UPC).





14. SCIENTIFIC PROGRAMME FOR THE YEAR 2003

14.6 PUBLICATIONS

Series *Preprints* Approximately 25-30 issues anticipated.

Series *Quaderns* Approximately 3-4 issues anticipated.

Series Advanced Courses in Mathematics CRM Barcelona

Symplectic Geometry of Integrable Hamiltonian Systems by M. Audin, A. Cannas da Silva and E. Lerman.

Global Riemannian Geometry: curvature and topology, by S. Markvorsen and M. Min-Oo.

Proper Group Actions and the Baum-Connes Conjecture, by G. Mislin and A. Valette.