BELGIAN MATHEMATICAL
SOCIETY

Comité National de Mathématique   CNM

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NCW   Nationaal Comite voor Wiskunde

**BMS-NCM NEWS: the Newsletter of the
Belgian Mathematical Society and the
National Committee for Mathematics**

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BMS-NCM NEWS
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No 57, March 15, 2006

Letter from the editor

Welcome to the "March 15, 2006 Issue" of our Newsletter!

*   After Halloween, Christmas and New Year... Carnival time is running now. Did you go to Rio? To Venice? To Binche? Or simply to your children' school?*

Françoise

Contents

1   News from the BMS

> **Please find enclosed the leaflet concerning the renewal of your BMS Membership (2006).**

Thank you for your attention!

2   Meetings, Conferences, Lectures

2.1   March 2006

**On Friday 17.03.2006 will be organized at the KVAB
(Koninklijke Vlaamse Academie van België) a 1-day meeting
Trends in Dynamical Systems**

Organizers: Freddy Dumortier, Dirk Roose and Andre Vanderbauwhede.
Program:

9:30-10:00	Welcome and coffee.
10:00-11:00	**J. Hofbauer***(University College London)*
	"To persist or not to persist."
11:00-12:00	**H.O. Walther***(Universität Giessen)*
	"State-dependent delays, linearization, and periodic solutions."
12:00-13:30	Lunch
13:30-14:30	**B. Krauskopf***(University of Bristol)*
	"Semiconductor lasers as dynamical systems"
14:30-15:30	**R. Roussarie***(Université de Bourgogne)*
	"Slow divergence integral and multiple canard cycles"
15:30-16:00	Coffee.
16:00-17:00	**A. Chenciner***(Université ParisVII)*
	"Unchained polygons and the n-body problem"
17:00-18:00	Drink

Everyone is cordially invited.

A lunch will be offered to the participants, free of charge. In view of the lunch and the coffee we would like to ask you to inform us, as soon as possible, about your intention to participate, by sending a short notice to **freddy.dumortier@uhasselt.be**. The meeting is destinated to a broad audience of people interested in getting informed about some recent results and ideas in dynamical systems, more especially systems described by differential equations. The meeting might also be interesting for PhD-students. For extra information on the meeting, including the abstracts of the talks, see **http://www.uhasselt.be/dysy/**

**Thu, 23.03.2006 SISTA Seminar
Dirk Aeyels - Samuel Xavier-de-Souza
K.U.Leuven, Electrical Engineering, Room 00.62 4:00 pm**

A dynamical model for cluster formation by Dirk Aeyels (University of Gent, SYSTEMS)

We present a dynamical model of mutually attracting agents. The long term behavior is characterized by agents organized into several clusters; transitions to new cluster configurations take place, depending on the intensity of the attraction. The number of clusters and which agents inhabit which clusters is determined by a set of inequalities in the parameters of the model. We consider the case where all agents are mutually attracted. The analysis of the clustering process is supported by a mathematical proof. As an illustration of the scope of the model, we indicate and discuss some applications.

Cooperative Behaviour in Coupled Simulated Annealing Processe by Samuel Xavier-de-Souza (K.U. Leuven, ESAT-SCD)

Suppose you have a task. You need to find the deepest valley in a vast and hilly landscape, but you are not alone. Together with you, there are a dozen of explorers, all equipped with a altimeter and a radio communicator. What would you do? which search strategy would you define? If you were alone, you would be facing a typical global optimization problem. However, you have the other explorers in your advantage. Cooperation is clearly

necessary in order to perform the task efficiently. In this seminar, we present a strategy to solve your problem based on the information your co-workers are exchanging. In order to solve global optimization problems with many local optima, we force cooperative behaviour to emerge among Simulated Annealing processes by coupling their acceptance probability functions. This approach does not only outperforms Parallel Simulated Annealing, but also reduces the sensitivity to initialization by means of a variance control.

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Le groupe modulaire
Etienne Ghys, directeur de recherche an CNRS
Mini-cours à LLN, 28-31 mars 2006

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Monsieur Etienne Ghys, directeur de recherche an CNRS et titulaire de la chaire de la Vallée Poussin 2006 donnera un mini-cours à Louvain-La-Neuve du 28 mars au 31 mars sur le thème du groupe modulaire.

Le programme des cours est le suivant

- Mardi 28 mars, à 11 heures : Dynamique sur le tore

- Mardi 28 mars à 15 heures : La fonction de Rademacher

- Mercredi 29 mars à 15 heures : les 3-tresses et lerus signatures

- Jeudi 30 mars à 15 heures : Les noeuds modulaires

- Vendredi 31 mars à 15 heures : SL(2,Z) est très différent de SL(3,Z)

Les cours auront lieu dans l'auditoire de la Vallée- Poussin, CYCL 01, bâtiment de Hemptinne, 2, chemin du cyclotron, 1348 Louvain-La- Neuve.

Toutes les personnes intéressées sont cordialement invitées.

<div align="right">

Yves Félix

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Colloquium "RISK CAPITAL ALLOCATION"
VUB, March 21 and 23, 2006

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For more information, see the announcement at the end of this Newsletter.

2.2   April 2006

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Genome et chromatine : de l'analyse multi-échelle des séquences d'ADN
à la modélisation de la réplication chez les mammifères

Alain Arneodo, ENS Lyon
Jeudi 6 avril 2006, 15:00, Institut de Mathématique ULg

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Everyone is welcome!
For more information, contact F. Bastin (F.Bastin@ulg.ac.be) or S. Nicolay (S.Nicolay@ulg.ac.be)

2.3   May 2006

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Archives de la Province belge méridionale de la Compagnie de Jésus
Groupe de contact "Histoire comparée des science" du F.N.R.S., Société Scientifique de Bruxelles

Journées consacrées au Père Henri Bosmans (1852-1928), 12 et 13 mai 2006

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Le R.P. Henri Bosmans SJ fut un historien belge des mathématiques. Ses travaux qui lui valurent une reconnaissance internationale portèrent beaucoup sur les mathématiciens de la Renaissance européenne, en particulier sur ceux des Pays-Bas catholiques des 16e et 17e siècles, mais il fut aussi le pionnier de l'étude conséquente des travaux par exemple de Simon Stevin. Il fut actif dans la vie scientifique de la Belgique, en

particulier dans la Société Scientifique de Bruxelles et dans la Société Mathématique de Belgique dont il fut l'un des fondateurs , et le Président de 1923 à 1925. Il eut de nombreux liens scientifiques de longues durées, avec notamment, en Belgique, Paul Mansion de l'Université de Gand - dont il fut l'élève- et , à l'étranger Paul Tannery, Moritz Cantor , Gustav Eneström, et Georges Sarton.

Ces journées se tiendront dans les locaux de l'ULB: au CIERL (Le Centre Interuniversitaire d'Etudes des Religions et de la Laicité), 17 avenue Roosevelt, 1050 Bruxelles .

Programme

Vendredi 12 mai
- 10 h : présentation des journées (Paul van Praag (UMH))
- 10h15-11.15 : Jean Mawhin (UCL) : *La tentative belge d'édition des oeuvres complètes d'Euler, vue par Henri Bosmans.*
- 11h30-12h15 Michel Hermans sj (Archives jésuites) : *Henri Bosmans: formation et réseaux de relations*
- Repas (*)
- 14h15-14h40 : Richard Delanghe (Universiteit Gent) : *Paul Mansion*
- 15h-16h : Patricia Radelet-de Grave (UCL): *Le Fonds Bosmans*
- 16h15 : discussion.

Samedi 13 mai
- 10h-11h : Antonella Romano (European University Institute,Florence): *Henri Bosmans, l'histoire et l'historiographie des sciences dans la Compagnie de Jésus*
- 11h15-12h : Jean-François Stoffel (Haute école Blaise Pascal, Haute école Charleroi-Europe): *Une terre d'accueil pour maints savants dont Henri Bosmans: la Société Scientifique de Bruxelles*
- 12h 15 : Discussion et conclusions.

Les frais de déplacements des membres des universités de la Communauté française de Belgique seront remboursés par le F.N.R.S.

(°) Un repas aux Restautants de l'ULB sera réservé à tout(e) participant(e) qui aura versé au plus tard le 28 avril la somme de dix euros au compte 210-0572971-44 de Paul van Praag-groupe de contacts FNRS, avec la communication "repas du 12 mai 2006".

Contacts: Michel Hermans, michel.hermans@fundp.ac.be; Dominique Lambert, d.lambert@fundp.ac.be; Jean-François Stoffel, jeanfrancois.stoffel@belgacom.net; Paul van Praag, paul.vanpraag@umh.ac.be

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**CANT'2006 International School and Conference
on Combinatorics, Automata and Number Theory**
Belgium, University of Liège, Department of Mathematics
May 8-19, 2006

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Aim:
The proposed international school is aimed at presenting and developing recent trends in Combinatorics (with emphasis on Combinatorics on Words), Automata Theory and Number Theory. On the one hand, the newest results in these areas shall benefit from a synthetic exposition, and on the other hand, emphasis on the connections existing between the main topics of the school will be sought. Concurrently to the school, there will be an international conference focusing on the same topics. Courses and lectures will be organized in the morning, while the afternoon sessions will be devoted to the conference.

Main Invited Speakers:
J.-P. Allouche (CNRS, Univ. Paris-Sud), Y. Bugeaud (Univ. of Strasbourg), F. Durand (Univ. of Picardie, Amiens), P. Grabner (Techn. Univ. of Graz), J. Karhumäki (Turku Univ.), H. Prodinger (Univ. of Stellenbosch), J. Sakarovitch (CNRS, ENS Télécom.), J. Shallit (Univ. of Waterloo), B. Solomyak (Univ. of Washington), W. Thomas (RWTH Aachen).

Format:
Five invited lecturers per week. Participants can decide to attend to one of the two weeks of this event. Talks will be selected on the basis of an extended abstract (max. 6 pages). Deadline for the submission of abstracts: April 1st, 2006. More details will be available in due time on the conference web site.

Organising Committee: V. Berthé (CNRS, Montpellier), M. Rigo, P. Lecomte (Liège).

<u>Location</u>: Institute of Mathematics, University of Liège, Belgium.
Information: e-mail: M.Rigo@ulg.ac.be
Web site: http://www.cant2006.ulg.ac.be

2.4   August 2006

See the announcement at the end of the January issue of our Newsletter for the meeting

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Evolution Equations 2006-in the memory of G. Lumer

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2.5   June 2006

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Groupe de contact FNRS – Funtional Analysis
June 1-2, 2006
Domaine du Rond-Chêne, Esneux

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The following speakers will deliver a talk (title to be announced in the next issue and in the second announcement of the meeting)

- CONEJERO Alberto (Valencia)

- DEFANT Andreas (Oldenburg)

- DIEROLF Suzanne (Trier)

- DISPA Sophie (Liège)

- HEINRICH Tobias (Düsseldorff)

- QUEFFELEC Hervé (Lille)

- TAYLOR BA (Ann Arbor, Michigan)

For further information, please contact Françoise Bastin at the address F.Bastin@ulg.ac.be

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Applied Dynamical Systems
June 22-23, 2006, Gent

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The organizers: Willy Govaerts (Gent), Dirk Roose (Leuven) and Yuri A. Kuznetsov (Utrecht, NL). For further information, see **users.ugent.be/ bsautois/workshop**

2.6   2008

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5ECM, July 14-18, 2008
5th EUROPEAN CONGRESS of MATHEMATICS

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Informations can be found at the address **http://www.5ecm.nl**

3   Summary of PhD theses

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Homology and homotopy in semi-abelian categories

Tim VAN DER LINDEN, Vakgroep Wiskunde, VUB, January 16, 2006

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I have written this thesis during my assistentship at the Vrije Universiteit Brussel, under the good care of my supervisor Rudger Kieboom. It was defended on the 16th January 2006.

The theory of *abelian* categories proved very useful, providing an axiomatic framework for homology and cohomology of modules over a ring and, in particular, abelian groups. For many years, a similar framework has been lacking for non-abelian (co)homology, the subject of which includes the categories of groups, rings, Lie

algebras etc. The point of my dissertation is that *semi-abelian* categories (in the sense of Janelidze, Márki and Tholen) provide a suitable context for non-abelian (co)homology and the corresponding homotopy theory.

A semi-abelian category is pointed, Barr exact and Bourn protomodular with binary coproducts. Examples include all abelian categories; all varieties of Ω-groups (i.e., varieties of universal algebras with a unique constant and an underlying group structure), in particular the categories of groups, non-unitary rings, Lie algebras, crossed modules, commutative algebras; internal versions of these varieties in an exact category; Heyting algebras and semilattices; compact Hausdorff (profinite) groups (or semi-abelian algebras); non-unitary C^* algebras; the dual of the category of pointed objects in any topos, in particular the dual of the category of pointed sets. Important differences between an abelian category and a semi-abelian one are that in a latter category, not every monomorphism is a kernel: e.g., in the case of groups, not every subgroup is a normal subgroup; there is no enrichment: in the case of groups, the pointwise product of two group homomorphisms need not be a homomorphism, let alone that this operation defines a group structure; and there are no biproducts: in the case of groups, binary "cartesian" products and coproducts (i.e., "free products") need not coincide.

Keeping these differences into account, it is possible to consider homology of (proper) chain complexes and of simplicial objects. Using techniques from commutator theory and the theory of Baer invariants, and generalizing Barr and Beck's cotriple homology, a general version of Hopf's formula and the Stallings-Stammbach sequence in homology are obtained. These results also have a cohomological counterpart: as in the case of groups or Lie algebras, the second cohomology group classifies central extensions, and we acquire a general version of the Hochschild-Serre sequence. We prove a universal coefficient theorem to explain the connection between homology and cohomology. On the homotopical level, we show that Quillen model category structures for simplicial objects and for internal categories (or crossed modules) exist, compatible with these notions of homology.

Analysis of DNA sequences with the wavelet transform: extraction of structural, dynamical and functional informations

Samuel NICOLAY, Université de Liège, April 06, 2006
Institute of Mathematics, room 01, 10:30

Advisor: Alain Arneodo(ENS Lyon); co-advisor: Françoise Bastin (ULg)

In an attempt to search for functional domains in the human genome, we use notions and tools from mathematics and physics such as scale invariance, multifractal formalism and wavelet transform (WT), for studying the nucleotide asymmetries between the two strands of the DNA double helix. This symmetry-breaking throughout evolution results from different mutation susceptibilities of the two strands during the processes of transcription and replication. The multi-scale approach of the WT lets us reveals two scaling domains corresponding to two different statistical behaviors of the nucleotide compositional skew. For scales between several thousands and several tens of thousands of base pairs, this skew is a bifractal signal with two scale invariance phases, a long-range correlated colored noise and a series of jumps, resulting from transcription bias. At scales above several tens of thousands of base pairs, we observe a specific "factory roof" like profile of the skew, which we have associated to the existence of a replication bias. This peculiar profile of the skew can be explained by a simple model of mammalian replication in which the origins are well positioned but the terminations are randomly placed in between. Using these results, we have been able to establish a multi-scale procedure for detecting germ line active replication origins directly from the DNA sequence. This in turn let us predict a thousand origins, whilst only a handful of them are experimentally identified to this day.

Optimal multilevel preconditioners for 4th order elliptic equations

Jan MAES (Dept. Computer Science, K.U.Leuven)
May 18, 13h30, Auditorium Kasteel, Arenbergpark, Heverlee.

Advisor: Adhemar Bultheel

In this dissertation we are concerned with the development of multilevel preconditioners for linear systems that arise from Galerkin methods for fourth order elliptic equations on two-dimensional polygonal domains. The key ingredients are the construction of multiscale bases for C^1 conforming finite element spaces of Powell–Sabin type, and the characterization of certain Sobolev spaces by weighted norm equivalences related to the multiscale

representation of functions. The latter immediately yields bounds on the growth rate of the condition numbers of the preconditioned systems. Multiscale bases that characterize a large range of Sobolev spaces are preferable, since the corresponding preconditioners are more robust. We explore different types of multiscale bases, such as a suboptimal standard hierarchical basis, an optimal hierarchical basis based on Lagrange interpolation, and several wavelet-type bases. On non-uniform triangulations we construct a biorthogonal wavelet basis that characterizes the Sobolev spaces $H^s(\Omega)$ with $s \in (0.802774, 2.5)$. On uniform triangulations we construct a semi-orthogonal wavelet basis that characterizes the Sobolev spaces $H^s(\Omega)$ with $|s| < 2.5$. Furthermore we develop an elegant way to extend the obtained results to similar constructions on the surface of the two-sphere.

4 Miscellaneous

4.1 Call for contributions

SIAM is launching a call for a contribution to a website, see http://www.whydomath.org
For more information on SIAM, see the pages at the address http://www.siam.org/news

4.2 From UMH

Le séminaire interuniversitaire de **logique mathématique** tient ses séances hebdomadaires le jeudi à 11h et à 14h30; le programme est disponible sur

$$\text{http://math.umh.ac.be/logic/seminars.htm}$$

4.3 From ULB

Our colleague Bernhard Mühlherr (ULB) obtains an award from the Académie Royale de Belgique (Prix Agathon De Potter - Mathématique 2006). This prize consists of 1000 euros and is awarded every two years.

5 Maths and art, fiction, . . .

Pop music goes 'mathematics'

Kate Bush *Aerial*, 2CD's Rock/Pop, EMI, Released 07/11/2005

After 12 years Kate Bush released a new album. Actually it is a double cd, called Aerial. And, you may not believe it, but she has a Pi-song on it. The second track on the first cd is called π and tells about a *"Sweet and gentle and sensitive man with an obsessive nature and deep fascination for numbers and a complete infatuation with the calculation of PI"*. The lyrics of the chorus are just the digits of π. *"They run, they run, they run him in a great big circle, in a circle of infinity"*. However, like some of the Kate Bush songs are surreal, also her notion of π is somewhat from another world. In the subsequent sections of the song (6'05), she sings about 118 digits of π that should follow the leading 3. However, although all goes well for the 53 first decimal places, but for the 54th, which should be 'zeeeeroooo', she uses 'oneeeee' instead, but liberal mathematicians could accept that as a slip of the tongue to match the meter of the lyric. She recovers completely for another 24 digits, and everything goes well until she reaches decimal 79, where her mind goes blank for 22 digits, which appear to live in a virtual mathematical world, and obviously not worth mentioning in her song. She pick up the sequence again with decimal 101 for the next 37 digits. However, and we can supposedly blame this again on the meter but, although the lyrics on the web site mention 5058223, the 0 and the 8 are not sung by Kate

So, to make the difference clear between real world pop songs and abstract mathematics:

Mathematical π: 3.
1415926535 8979323846 2643383279 5028841971 6939937510
5820974944 5923078164 0628620899 8628034825 3421170679
8214808651 3282306647 0938446095 5058223172 . . .

π sung by Kate Bush: 3.
1415926535 8979323846 2643383279 5028841971 6939937510
5821974944 5923078164 06286208_____
8214808651 3282306647 0938446095 5_5_223. . .

Note that Kate ends in a correct rounding of the last digit, which is a truncation in this case.

You can find much more info about the album on the site http://www.katebush.com.

This song reminds me of another double album of 1971 *H.M.S. Donovan*, where Donovan Leitch brings a number of poetical songs, some of which referring to Alice in Wonderland. There is also one song called *The Pee Song* (track 2 on side 3), but that was about something completely different, or was it?
See http://www.houseoflyrics.com/d/artists/donovan/songs/the_pee_song.html.

Adhemar Bultheel and Paul Levrie

Vrije Universiteit Brussel

In het kader van de Leerstoel K.V.B.A; Belgische Vereniging Actuarissen
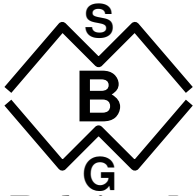
"RISK CAPITAL ALLOCATION"

Dinsdag 21 maart '06
Vrije Universiteit Brussel
Promotiezaal D.2.01
17:00-18:00 deel I
18.00 koffiepauze, D.2
18:30-19:30 deel II
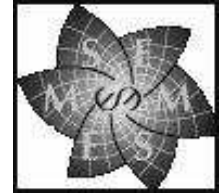19:30-21:00 receptie D.2

In het kader van het ULB-VUB seminarie

"Risk Measures and Backward Stochastic Differential Equations"

Donderdag 23 maart '06
Université Libre de Bruxelles
Forum A
16:00

Belgian Mathematical Society

http://bms.ulb.ac.be/

European Mathematical Society

http://emis.de/

Be a member of the
Belgian Mathematical Society (BMS)
and of the
European Mathematical Society (EMS)

As a member of the *BMS*

You will receive five times a year **BMS-NCM NEWS**, the Newsletter of the **BMS** and of the National Committee for Mathematics (**NCM**), containing information on what's going on in mathematics in Belgium.

You will receive the "**Bulletin of the BMS - Simon Stevin**", a periodical containing peer reviewed papers as well as book reviews.

You will benefit of reciprocity agreements with the AMS, DMV, LMS, RSME, SMF, SBPMef, VVWL, WG.

As a member of the *EMS*

You will receive a Newsletter of high interest containing papers, interviews, European meeting announcements, book reviews, . . . For more information: see **http://emis.de**

As a member of the *BMS* and the *EMS*

You are taking part in the mathematical life in Belgium and in Europe.

You give the two Societies the possibility to develop their actions: organizing meetings and lobbying with the authorities.

You provide more strength to the two Societies, enabling them to promote mathematics and its financing.

The *BMS* and the *EMS* help you

The **BMS** has conceived and promoted the on line access to the **Zentralblatt** in the Belgian Universities.

The **EMS** seeks to promote mathematics in the program of the European Union.

BMS and EMS membership dues for 2006 (see also the website of the bms at the address http://bms.ulb.ac.be/)[1]

BMS membership:	**EUR 19.00**
BMS + EMS membership:	**EUR 39.00**

Activities of the *BMS* and of the *EMS*

The **BMS** has been active in organizing international congresses. **1996** Antwerp: joint meeting with the AMS and the three BeNeLux Societies. **1999** Brussels: joint LMS-**BMS** meeting. **2001** Liège: joint DMV-**BMS** meeting. **2003** Brussels: conference on Mathematics and Genomics. **2004** Tilburg: joint conference with the Dutch Mathematical Society. **2005** Gent: joint meeting with SMF and the three BeNeLux Societies.

The **BMS** and the National Committee for Mathematics have published official standpoints in the BaMa discussion and in the use of the Science Citation Index and Impact Factors for the evaluation of mathematicians. This has been approved by the **EMS**.

The activities of the **EMS** are numerous and of high quality with the organization of a Congress every four years (Paris in 1992; Budapest in 1996; Barcelona in 2000; Stockholm in 2004 and Amsterdam in 2008), with the Forum Mathématique Diderot, with the publication of the **Journal of the EMS**. The **EMS** has also created its own publishing house and offers a large and well-maintained collection of non-commercial journals and books on **EMIS**, the European Mathematics Information Service (www.emis.de).

Committee of the*BMS*

Catherine Finet (UMH)(president), Stefaan Caenepeel (VUB) (vice-president), Jan van Casteren (UA)(secretary), Guy van Steen (UA) (treasurer), Hendrik Van Maldeghem (RUG) (editor in chief of the Bulletin), Françoise Bastin (ULg) (Editor of the Newsletter), Pierre Bieliavsky (UCL), Adhemar Bultheel (KUL), Philippe Cara (VUB), Eva Colebunders (VUB), Camille Debiève (UCL), Freddy Dumortier (LUC), Yves Felix (UCL)(Book Review Editor), Paul Godin (ULB), Albert Hoogewijs (RUG), Pierre Lecomte (ULg), Christian Michaux (UMH), Philippe Toint (FUNDP), Michel Van den Bergh (LUC), Lieven Vanhecke (KUL), Marc Willem (UCL)

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[1]Dues are to be paid on account number **000-0641030-54**
Belgian Mathematical Society, Campus Plaine, CP. 218/01, Bld. du Triomphe, B-1050 Brussels.

Membership Application/Renewal Form

New members, members paying by creditcard and members whose address or email has changed are requested to fill in this Membership Application Form or to register online at
http://bms.ulb.ac.be/membership/appl-form.php

Name: ....

Address: ....

Postal code: .... **City:** .... **Country:** ....

E-mail: ....

Occupation: .... **Place of Work :** ....

Please tick the appropriate lines:

☐ I want to be an ordinary member of the **BMS** (EUR 19.00).

☐ I apply for a BMS reciprocity membership (EUR 17.00); I am a member of the ....
(see page 1 for the list of the reciprocating societies).

☐ In addition to my BMS membership, I want to be a member of the EMS (add EUR 20.00).

☐ I do not agree that the Newsletter BMS-NCM News be sent to me by e-mail.

☐ I do not agree that my affiliation and e-mail address are published.

☐ I do not agree that my affiliation and e-mail address are made available on the web site of the BMS.

☐ I shall pay my dues, which in total amount to . . . ,. . . EURO on account number
000-0641030-54 of the BMS (IBAN BE 42 0000 6410 3054; BIC BPOTBEB1)
☐ Please charge my credit card to the amount of . . . ,. . . EURO
☐ VISA   ☐ EUROCARD   ☐ MasterCard

Card number: | | | | | | | | | | | | | | | | | |

Expiration Date: | | | | |

Date: Cardholder's signature: ....