

BELGIAN MATHEMATICAL SOCIETY

Comité National de Mathématique CNM



NCW Nationaal Comité 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

No 48, May 15, 2004



1 News from the BMS

During the meeting of the BMS Committee held on January 10, 2004, the following items were discussed.

- It is important to note that the (new) fax number of the BMS is +32 (0) 3 265 3777 ; this is the fax number of the Department of Mathematics and Computer Science, University of Antwerp.

Moreover, it is decided to add the following postal address on all official paperwork: *Secretary of the Belgian Mathematical Society, Department of Mathematics and Computer Science, University of Antwerp, Middelheimlaan 1, 2020 Antwerp.*

- The study day on Mathematics and Genomics (October 18, 2003) was successful; generally, the members think that other initiatives on inter-disciplinary topics should be launched.
- Reactions to the letter about Science Citation Index and Impact factors.

This letter was sent to the Rectors of the Universities, to the Deans of the Faculties of Science and Engineering, to the Chairpersons of the Departments of Mathematics (or of Mathematics and Computer Science), to the Heads of the Research Councils, to the Ministries, and to the Secretary General of the FNRS and of the FWO. The letter can also be viewed on the following web page of the BMS: <http://bms.ulb.ac.be/documents/scieng.pdf>. So far there are no university authorities who have given an official reaction to this letter. There were some positive reactions from individual mathematicians.

During the meeting of the BMS Committee held on May 8, 2004, the following items were discussed.

- The joint Congress of the Royal Dutch Mathematical Society and the BMS, held on April 16–17 2004 in Tilburg (NL), was interesting from several points of view: quality of the lectures, organization. Unfortunately some of the sessions had only very few listeners.
- The item on the number of members of the BMS caused a discussion about the “visibility” and “attractiveness” of the BMS. The general question which arose reads: How can we make the BMS more attractive to young (and old) mathematicians? Of course there is also another side of the medal: What can I, as a mathematician, do for the mathematical society? A sub-committee of about 7 people will discuss this matter and try to find some answers concerning this issue. Ideas vary from prize winning dissertations to hanging posters in lecture halls.
- For the next term of the presidency of the BMS (2005 – 2008) a new (Flemish) vice-president has to be appointed.
- The “Bulletin of the BMS Simon Stevin” will be exchanged with the “Annales de la Faculté des Sciences, Mathématiques” (University of Toulouse), and also with certain publications (in English) of IMPA, Rio de Janeiro.

2 Meetings, seminars, conferences

2.1 May 2004

Risk Analysis: Statistical and Probabilistic Methods

KUL, May 26-27, 2004

Next spring, a two-days colloquium “Risk Analysis : Statistical and Probabilistic Methods” is organized at the Katholieke Universiteit Leuven on May 26-27. This colloquium is organized by the University Center for Statistics and the research group on Actuarial Sciences.

For more information about the colloquium, please consult the colloquium website

<http://www.kuleuven.ac.be/ucs/colloq.htm#jlt>

with more details as they become available.

In name of the organizing committee, An Carbonez

First International Maurice Boffa Lectures

University of Mons-hainaut, May 27, May 28, June 3, June 10, 2004

Under the impulsion of some friends of Maurice Boffa, the University of Mons-Hainaut has founded the International Maurice Boffa Lectures. They will be awarded, for the first time, at Thomas Scanlon, from the University of Berkeley.

Program

The general lecture will be given on May 27, 2004, 14h30, in the Grands Amphithéâtres of the University of Mons-Hainaut. More specialized lectures will be delivered on May 28, June 3 and June 10, 2004. At this occasion, a two-day meeting in Model Theory will be held at the University of Mons-Hainaut on May 27,28.

Thomas Scanlon (Berkeley)

Thursday 27th of May, 2004 at 14h30

Model Theory of Valued Difference and Differential Fields

From Gödel's Incompleteness Theorem one might conclude that structures from arithmetic have inherently complicated theories. However, the work of Ax, Kochen and Eršov (and others) on valued fields demonstrated that p -adic fields and their relatives have decidable theories and well-behaved classes of definable sets. Later work showed that these properties persist for these fields in even richer languages. We discuss some of these expansions and show how these model theoretic uniformities may be used in number theory.

Friday 28th of May, 2004 at 11h

Quantifier elimination for the relative Frobenius

We give a (reasonably) detailed proof of a quantifier elimination theorem for theory of the Witt vectors of an algebraically closed field considered as a difference ring with the relative Frobenius as the distinguished automorphism. This work is joint with Bélair and Macintyre.

Model theory meeting

The following lectures will take place in the Grands Amphithéâtres of the University of Mons-Hainaut.

ANGUS MACINTYRE (Edinburgh)

The Complex Exponential and the Zilber-Schanuel Exponential. Thursday 27th of May, 2004 at 10h30

BRUNO POIZAT (Lyon)

A la recherche de la structure intrinsèque de l'Univers. Thursday 27th of May, 2004 at 16h45

ZOÉ CHATZIDAKIS (Paris7)

Asymtotic theories of fields. Friday 28th of May, 2004 at 9h30

Complete program and registration will be available on the website : <http://www.umh.ac.be/math/logic> or by sending an e-mail to christian.michaux@umh.ac.be

Address:

Les Grands Amphithéâtres, Université de Mons-Hainaut, 6 Avenue du Champ de Mars, 7000 Mons.

Maurice Boffa (1939–2001)

The department of Mathematical Logic of the University of Mons-Hainaut was founded by Maurice Boffa (1939–2001), who was the head of the department from 1973 upto his death in 2001, at the age of 61. He also held a part-time position at the Free University of Brussels, where he had been a student of Georges Papy. He played a fundamental role in the development of mathematical logic in Belgium; the seminar in Brussels that he created and animated brought together most French speaking Belgian logicians. Many of the current Belgian logicians were his students. His wide ranging research interests included set theory, model theory, automata theory, and group theory, although he perhaps exercised his greatest influence in work dealing with Quine's New Foundations. Boffa's life revolved around mathematics, which he loved to discuss, but he also took great pleasure in playing jazz piano, collecting books on varied subjects, and having a beer or glass of red wine with his friends. His wife Michelle and he formed a couple well-known for their hospitality. He had a very clear mind that showed in the questions he asked, in his lectures, and his numerous concisely written papers. An almost complete bibliography can be found on the site : <http://www.logic.uni-kl.de/BIBL/index.html>

2.2 June 2004

**Centre d'analyse fonctionnelle, Groupe de contact F.N.R.S.
Université de Liège, Analyse fonctionnelle**

Functional Analysis and Partial Differential Equations

Han-sur-Lesse, June 7–8, 2004, Domaine des Mesures

The next meeting is organized at the “Domaine des Mesures” in Han-sur-Lesse. It will start on Monday June 7 around 14:00 and will end on Tuesday June 8 in the early afternoon.

The following speakers are expected:

S. AGETHEN (University of Paderborn)

Weighted spaces of holomorphic functions on the upper half plane

P. BEAUGENDRE (Orsay)

Opérateurs d'extension linéaires dans des intersections de classes ultradifférentiables de jets

J. BONET (Polytechnical University of Valencia)

The canonical spectral measure for Köthe echelon spaces

S. JAFFARD (University of Paris XII)

Wavelet analysis of interfaces with very irregular boundaries

D. VOGT (University of Wuppertal)

Interpolation problems for real analytic functions

J. WENGENROTH (University of Trier)

Convolution equation for ultradistributions

J. ZAFARANI (University of Isfahan)

KKM maps in topological spaces

If you intend to participate in the meeting, please ask for a registration form to one of the organizers. Due to the limited number of possible participants (around 30 to 35), we might have to cancel some registrations. The choice will be made according to the rule “first claimed, first served”. A letter dated early May will let you know about this.

F. Bastin: F.Bastin@ulg.ac.be, J. Schmets: J.Schmets@ulg.ac.be, J.-P. Schneiders jpschneiders@ulg.ac.be

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Trends in geometry

Roma June 7 – 9, 2004

Trends in geometry in memory of Beniamino Segre (1903-1977) Roma June 7 – 9 2004. Web site: <http://www.mat.uniroma1.it/segre2004/>

Seminar Sophus Lie

Metz, June 11 and 12, 2004

The “Seminar Sophus lie”, a two-day conference centered mainly on Lie groups, harmonic analysis and operators algebras, is to be held in metz on June 11,12, 2004.

More details can be found on the following web site: <http://www.mmas.univ-metz.fr/pasquale/SSL/SSL04.html>

Third Croatian Congress of Mathematics

Split, Croatia, June 16-18 2004

I am glad to inform you that the Third Croatian Congress of Mathematics will held in Split, Croatia, June 16-18 (<http://www.pmfst.hr/congress/>). We would like to have our Congress with a strong international component.

Nikica Uglesic, President of the Scientific Committee.

5th International Conference on Functional Analysis and Approximation Theory

Maratea, June 16-23, 2004

Organizing Committee: F. Altomare, A. Attalienti, L. D'Ambrosio, M. Campiti, S. Diomede, G. Mastroianni, D. Occorsio, M. G. Russo.

The meeting will be devoted to some significant aspects of contemporary mathematical research on Functional Analysis, Operator Theory and Approximation Theory including the applications of these fields in other areas such as partial differential equations, integral equations, numerical analysis and stochastic analysis.

See the pages <http://www.dm.uniba.it/faat2004> and <http://www.dm.unile.it/faat2004>

Colloque d'analyse non linéaire

En l'honneur de Haim Brezis, à l'occasion de son soixantième anniversaire.

Paris, du 21 au 25 juin 2004

Dates et lieu: du 21 au 25 juin 2004. Le Carre des Sciences, rue de la Montagne Sainte Genevieve, 75005 Paris.

Conférenciers: A. Aftalion, L. Ambrosio, G.I. Barenblatt, F. Bethuel, J. Bourgain, X. Cabre, L. Caffarelli, A. Chang, Y. Choquet-Bruhat, P. Constantin, L.C. Evans, F. Hamel, S. Klainerman, J.-F. Le Gall, Y.Y. Li, E.H. Lieb, F.-H. Lin, P.-L. Lions, H. Matano, Y. Meyer, M. Mimura, S. Muller, N. Nadirashvili, F. Otto, S. Serfaty, G. Sivashinsky, E. Stein.

Renseignements: <http://www.ann.jussieu.fr/HB2004/> Contact : hb2004@ann.jussieu.fr

Inscription gratuite mais souhaitée (via adresse internet ci-dessus).

Comité d'organisation: H. Berestycki, M. Bertsch, M. Chipot, M. Comte, J.-M. Coron, I. Diaz, Y. Maday, I. Shafrir, D. Smets, L. Veron.

Comité scientifique: A. Ambrosetti, A. Bahri, H. Berestycki, J.-P. Bourguignon, F. Browder, J.-M. Coron, G. Da Prato, M. Giaquinta, D. Kinderlehrer, L. Nirenberg, B. Peletier, J. Serrin, R. Temam.

Summer School on Mathematical and Scientific Visualization

June 21-25, 2004, Maubeuge University Centre

The "Association pour la création de la Cité des Géométries" is organising a Summer School on Mathematical and Scientific Visualization in partnership with Université de Valenciennes et du Hainaut-Cambrésis (UVHC) and Zuse Institut Berlin. Meeting June 21 – 25 2004.

Mathematicians sometimes need to visualize their research and therefore build the algorithms needed for visualization. Their processes allow the development of software applications in many fields, such as materials, biology, biochemistry, medical imaging, astrophysics... The Summer School, which will be held from June 21st to 25th 2004 at Maubeuge University Centre, will offer theoretical courses as well as practical exercises to highlight the various applications covered by visualization. The Summer School targets maths students with a 4-year degree at least.

Francis Trincaretto, President

Aziz El Kacimi, Professor, UVHC

Association pour la création de la Cité des Géométries

4th ECM

June 28 – July 2, 2004

Meeting EMS committee June 27 (4th ECM June 28 – July 2, 2004). Web site: <http://www.math.kth.se/4ecm/>

2.3 July 2004

ICCAM 2004
Eleventh International Congress on Computational and Applied Mathematics
 Katholieke Universiteit Leuven, Belgium, July 26-30, 2004

For more information: <http://www.cs.kuleuven.ac.be/conference/iccam2004/iccam.htm>

11th International Mathematics Competition for University Students
 July 23 – 29, Skopje Macedonia

See the pages <http://www.imc-math.org/>

2.4 September 2004

Tenth Mons theoretical computer science days
 University of Liège, September 8-11, 2004

Theme: Some aspects of theoretical computer science and discrete mathematics related to combinatorics on words (in the broad sense).

Scopes: This conference is widely open to young researchers. Notice that English and French are the two official languages of the meeting.

Topics: Combinatorics on words (including algebraic and algorithmic aspects), all aspects of formal languages theory, variable length codes, automata theory and verification.

Main Speakers: J. Cassaigne, D. Caucal, C. Frougny, T. Helleseth, S. Langerman, F. Neven, M.-F. Sagot.

Call for papers: please check the webpage.

Organizers: J. Berstel, V. Bruyère, P. Lecomte, M. Rigo.

Location: Institute of Mathematics, University of Liège (Belgium).

Grants: Some financial support for young scientists is expected, see the conference website for updated information.

Deadline: 1st June for submission of a paper, 1st August for registration.

Information: e-mail : M.Rigo@ulg.ac.be , website : <http://www.jm2004.ulg.ac.be>

2.5 October, 2004

Symposium Henri Poincaré
 October 8-9, 2004, ULB

See the announcement at the end of this Newsletter.

2.6 2005, 2006

- SMF, Royal Dutch Mathematical Society, Luxembourg Mathematical Society, Belgian Mathematical Society: joint meeting on 20-22 May, 2005, Gent, Belgium.

See Newsletter 44, September 2003.

- IVth International Workshop on Functional Analysis, September 5-9, 2005, Esneux, Belgium

See the announcement at the end of this Newsletter.

- International Congress of Mathematicians. Madrid, Spain; 22–30 August 2006. See: <http://www.icm2006.org/>

3 Summary of PhD theses

PhD at K.U.Leuven by Evelyne Vanraes, 27 April, 2004.

Promotor: A. Bultheel

Powell-Sabin splines and multiresolution techniques

Powell-Sabin splines are piecewise quadratic polynomials with global C^1 continuity. In contrast to the widely used tensor product B-splines and NURBS, they are defined on triangular patches which has certain advantages. In this dissertation we place Powell-Sabin splines in a multiresolution context. Multiresolution techniques are concerned with the generation, representation and manipulation of geometric objects at different levels of detail. The main ingredient here is a subdivision scheme to compute a representation of a surface on a refined triangulation. Such a refined triangulation has more vertices and more and smaller triangles than the original triangulation. The new basis functions after subdivision have smaller support and give the designer more local control. It makes it possible to represent a surface on different levels of detail. A standard dyadic scheme cannot be used for non uniform triangulations where the vertices are not regularly spaced. Instead we propose a $\sqrt{3}$ scheme. Applying this scheme twice results in a triadic scheme. When going back from a fine resolution level to a coarser resolution level, fine detail is lost. We develop a wavelet decomposition algorithm that transforms a fine scale surface into a coarse scale approximation and a detail part that lives in a complement space. We use the lifting paradigm with the triadic subdivision scheme as prediction step. Because the domain triangles need not to be uniform, we pay special attention to stability in the design of the update step. The multiresolution techniques for splines can only be applied in the functional case or when the object is defined as a parametric surface. We propose an extension of a dyadic subdivision algorithm voor uniform Powell-Sabin splines to arbitrary topologies. In this setting a surface is defined procedurally as the limit of a refinement process.

More information about the contents of this thesis other PhD's of the Department of Computer Science at the K.U.Leuven can be found at <http://www.cs.kuleuven.ac.be/publicaties/doctoraten/>

PhD at K.U.Leuven by Dirk Segers, 30 April, 2004.

Promotor: W. Veys

Smallest poles of Igusa's and topological zeta functions and solutions of polynomial congruences

Igusa's p -adic zeta function belongs to the domain of number theory. It was introduced by Weil in 1965 and the basic properties of this function were studied by Igusa. I consider here the relevant situation in which Igusa's p -adic zeta function is associated to a polynomial $f \in \mathbb{Z}[x_1, \dots, x_n]$ and in which it is defined as the meromorphic continuation of the function that associates to a complex number s with positive real part the integral of $|f|_p^s$ over \mathbb{Z}_p^n . If we denote the number of solutions of the congruence $f \equiv 0 \pmod{p^i}$ by M_i , then we have that all the M_i 's together form exactly the information which is contained in this zeta function. The intensive study of Igusa's p -adic zeta function by using an embedded resolution of f led to the introduction of the topological zeta function. This geometric invariant of the zero locus of a polynomial $f \in \mathbb{C}[x_1, \dots, x_n]$ was introduced in the early nineties by Denef and Loeser. It is a rational function which they obtained as a limit of Igusa's p -adic zeta functions and which is defined by using an embedded resolution.

The smallest real parts of the poles of these zeta functions are studied in the thesis. Note that the poles of the topological zeta function are rational numbers. For this zeta function, it is thus unnecessary to take the real part.

For $n = 2$ and $n = 3$ these zeta functions are studied by using embedded resolutions. We determine all values less than $-1/2$ if $n = 2$ and less than -1 if $n = 3$ which are the real part of a pole. If $n = 2$ there are no poles with real part less than $-1/2$ and different from -1 if there is no singular point of multiplicity two or three. If $n = 3$ we prove that there are no poles with real part less than -1 if there is no singular point of multiplicity two. For this we have to prove that some candidate poles are not a pole. We use a formula of Veys to treat the topological zeta function, for Igusa's p -adic zeta function we have to deduce a formula for the residue at a candidate pole of expected order one ourselves.

We also give a description of the smallest real part of a pole of Igusa's p -adic zeta function in terms of the M_i . Using this approach, we prove for arbitrary n that there are no poles with real part less than $-n/2$. We get this lower bound also for the topological zeta function by taking the limit. An example shows us that this bound is optimal.

PhD at K.U.Leuven by Gregory Neven, May 7, 2004.

Advisors: Frank Piessens and Bart De Decker

Provably secure identity-based identification schemes and transitive signatures

Cryptography is an ancient craft, but relatively young as a true science. Techniques that offered a reasonable level of protection many centuries ago, are clearly insufficient to meet the communication needs of today's digitalized society. Until the 1980s however, cryptographic design remained a craft, rather than a science: schemes were proposed with at most an intuition for their security, the sole criterion being resistance against attacks after years of exposure to experts.

A more modern approach is that of provable security. This approach requires the designer of a scheme to first clearly state what is understood under the security of the scheme. Next, a mathematical proof is needed showing that the only way to break the scheme is either by attacking an insecure underlying cryptographic building block, or by realizing a mathematical breakthrough. Provable security has evolved from a toy for theoreticians to an important scheme characteristic that is taken into account in the decision of industry standards.

In this thesis, we study the provable security of selected cryptographic primitives. We first distill useful yet feasible security notions, and subsequently prove the security of existing and new schemes under these notions.

The first part focuses on identity-based identification and signature schemes. These are cryptographic primitives providing entity and message authentication, respectively, that allow the public key of a user to be simply his identity (instead of a random string that has to be securely attributed to the user). As a first step, we present a general framework of security-preserving transformations between related primitives. We then use this framework as a tool to prove (and in a single instance, break) the security of schemes from 13 different "families" that were proposed in the literature over the last two decades, but that lacked a security proof prior to our work.

In the second part of this thesis, we discuss transitive signature schemes. These are signature schemes that allow to sign edges of a graph such that any user (and not just the signer) can, from two signatures on adjacent edges i,j and j,k , compute a third signature for the direct edge i,k . We answer an open question regarding the security of a particular scheme, and present a number of new, provably secure schemes offering efficiency advantages over existing schemes.

<http://www.cs.kuleuven.ac.be/publicaties/doctoraten/CW/>

PhD at K.U.Leuven by Joris Van Deun, May 24, 2004.

Advisor: Adhemar Bultheel

Orthogonal rational functions: asymptotic behaviour and computational aspects

Orthogonal rational functions with fixed poles are a natural generalization of orthogonal polynomials. Most attention so far has gone to the case of orthogonality on the complex unit circle or on the real line, where many polynomial results have been generalized to the rational case. In this thesis we extend several of these results to the case of orthogonality on a finite interval. First we study different types of convergence. Ratio asymptotics are derived and then used to obtain the asymptotic behaviour of the recurrence coefficients. We conclude this part with some strong and weak-star convergence results. Next we briefly study the convergence of gaussian quadrature formulas on the interval and their relation with formulas on the unit circle. A substantial part of this thesis is devoted to computational aspects of orthogonal rational functions, both on an interval and on a halfline. We give some interpolation algorithms and generalize the method of modified moments to the case of rational functions. Next, a generally applicable and numerically stable algorithm is provided to compute the recurrence coefficients, together with computable error bounds. The case of poles close to the interval of integration is treated separately, because of the additional numerical difficulties. Finally, as a case study we generalize the well-known Chebyshev polynomials to the rational situation and present some related quadrature formulas which allow fast and efficient computation.

<http://www.cs.kuleuven.ac.be/publicaties/doctoraten/TW/>

PhD at K.U.Leuven by Raf Vandebril, May 26, 2004.

Advisor: M. Van Barel

Semiseparable matrices and the symmetric eigenvalue problem

In this thesis one of the basic linear algebra problems is considered, namely the symmetric eigenvalue problem. More precisely we translate the traditional method, based on tridiagonal matrices towards a tool based on semiseparable matrices. Three important parts are considered.

Firstly, the connection between the class of semiseparable matrices and tridiagonal matrices is thoroughly investigated. We define semiseparable matrices, such that the invertible ones have as inverse a tridiagonal matrix, and vice versa. It is shown that the symmetric semiseparable matrices can be represented by a Givens-vector representation having $2n-1$ parameters. Moreover, we show that this representation has nice numerical properties when solving eigenvalue problems.

In the second part of the algorithm, a method is proposed, for reducing, via orthogonal similarity transformations a matrix into a similar semiseparable one. The constructed method inherits some convergence properties, such as subspace iteration, and a type of Lanczos-convergence, which are fully investigated.

In the final part of the thesis, a detailed investigation is made of the QR-factorization of semiseparable matrices, unreduced semiseparable matrices, and an implicit Q-theorem for semiseparable matrices; leading to an implicit QR-algorithm for semiseparable matrices.

The combination of the results of Part 2 and 3 leads to a solver for the symmetric eigenvalue problem. Even more, an adaptation of the results presented in these parts is included, such that also the unsymmetric eigenvalue problem, and the singular value problem, can now be solved via semiseparable matrices.

Numerical experiments are included, and the corresponding software is made available.

<http://www.cs.kuleuven.ac.be/publicaties/doctoraten/TW/>

4 Mathematical Olympiad

4.1 Solution to problems of the previous Newsletter

Problem. The sequence a_n is defined by $a_1 = 20$, $a_2 = 30$, $a_{n+1} = 3a_n - a_{n-1}$. Find all n for which $5a_{n+1}a_n + 1$ is a square.

Solution. Prouvons que c'est le cas si et seulement si $n = 3$. Tout d'abord, prouvons par récurrence sur n que

$$a_n^2 - 3a_n a_{n+1} + a_{n+1}^2 + 500 = 0. \quad (1)$$

C'est vrai pour $n = 1$. Soit $n \geq 2$. En remplaçant a_{n+1} par sa définition $a_{n+1} = 3a_n - a_{n-1}$, on trouve que le premier membre de (1) égale $a_{n-1}^2 - 3a_{n-1}a_n + a_n^2 + 500$, qui est nul par hypothèse de récurrence. Nous avons donc démontré (1), qui peut encore s'écrire

$$5a_n a_{n+1} + 1 = (a_n + a_{n+1})^2 + 501. \quad (2)$$

Ceci entraîne

$$(a_n + a_{n+1})^2 < 5a_n a_{n+1} + 1 \quad (3)$$

donc si $(a_n + a_{n+1})^2 + 501 < (a_n + a_{n+1} + 1)^2$, la relation (2) donne $(a_n + a_{n+1})^2 < 5a_n a_{n+1} + 1 < (a_n + a_{n+1} + 1)^2$ et il est clair que $5a_n a_{n+1} + 1$ n'est pas un carré. Ainsi, $5a_n a_{n+1} + 1$ ne peut éventuellement être un carré que si $(a_n + a_{n+1})^2 + 501 \geq (a_n + a_{n+1} + 1)^2$, c'est-à-dire si $a_n + a_{n+1} \leq 250$.

On prouve par récurrence sur n que $a_{n+1} \geq a_n$ pour tout $n \geq 1$ (car l'hypothèse de récurrence $a_{n-1} \leq a_n$ donne $a_{n+1} \geq 3a_n - a_n$), autrement dit la suite a_n est croissante. On ne peut donc avoir $a_n + a_{n+1} \leq 250$ que si $n \leq 3$.

On vérifie que, parmi les nombres $n = 1, 2$ et 3 , seul $n = 3$ est tel que $5a_n a_{n+1} + 1$ (égal à $63001 = 251^2$) soit un carré.

Remarque. La suite a_n est en rapport avec la suite de Fibonacci. Par exemple, $a_n = 10(F_{2n-1} + F_{2n-3})$.

A. Delcourt

Problem. Show that there is no function f defined on the set of positive real numbers such that $f(y) > (y-x)(f(x))^2$ for all x, y with $y > x > 0$.

Solution. Supposons que, par absurde, f soit une telle fonction. Pour tout $y > 0$, il existe x tel que $0 < x < y$; pour un tel x , nous avons, par hypothèse, $f(y) > (y-x)(f(x))^2$, donc

$$f(y) > 0 \text{ pour tout } y < 0. \quad (1)$$

Soit s un nombre naturel > 1 possédant la propriété suivante : pour tous x, y tels que $0 < x < y$,

$$f(y) > \frac{s^s (y-x)^{s-1} (f(x))^s}{4^{s-1} (s-1)^{s-1}} \quad (2)$$

(Ceci est vrai pour $s = 2$, par hypothèse.)

Soient $0 < x < t < y$. Puisque $x < t$, (2) donne

$$f(t) > \frac{s^s(t-x)^{s-1}(f(x))^s}{4^{s-1}(s-1)^{s-1}} \quad (3)$$

Puisque $t < y$, (2) donne aussi

$$f(y) > \frac{s^s(y-t)^{s-1}(f(t))^s}{4^{s-1}(s-1)^{s-1}} \quad (4)$$

En élevant (3) à la puissance s , on obtient une minoration de $(f(t))^s$ qui, portée dans (4), donne

$$f(y) > \frac{s^{s(s+1)}(y-t)^{s-1}(t-x)^{s(s-1)}(f(x))^{s'}}{4^{s'-1}(s-1)^{s'-1}} \quad (5)$$

où s' est mis pour s^2 .

En annulant la dérivée de $(y-t)(t-x)^s$ par rapport à t , nous obtenons la valeur de t qui rend maximal $(y-t)(t-x)^s$, et donc aussi $(y-t)^{s-1}(t-x)^{s(s-1)}$. Cette valeur est $t = (x + sy)/(s + 1)$, qui, portée dans (5), donne

$$f(y) > \frac{s'^{s'}(y-x)^{s'-1}(f(x))^{s'}}{4^{s'-1}(s'-1)^{s'-1}}$$

où s' est mis pour s^2 . Ceci prouve que si l'hypothèse (2) est satisfaite pour un nombre naturel $s > 1$, elle est satisfaite pour s^2 (6).

Désignons par S l'ensemble des nombres naturels qu'on peut obtenir à partir de 2 par élévations successives au carré. Autrement dit, S est l'ensemble des puissances de 2 dont l'exposant est de la forme $2n$, avec n naturel ≥ 0 . Nous avons vu que (2) est vraie pour $s = 2$, donc notre résultat (6) permet de prouver par récurrence que, pour tout élément s de S et pour tous x, y tels que $0 < x < y$,

$$f(y) > \frac{s^s(y-x)^{s-1}(f(x))^s}{4^{s-1}(s-1)^{s-1}}.$$

Puisque les s considérés sont > 1 , nous avons $s^s > (s-1)^{s-1}$, donc

$$f(y) > \frac{(y-x)^{s-1}(f(x))^s}{4^{s-1}} \quad (7)$$

pour tout élément s de S . Compte tenu de (1), $f(x) > 0$, donc (7) peut s'écrire

$$\frac{f(y)}{f(x)} > \frac{(y-x)^{s-1}(f(x))^{s-1}}{4^{s-1}}.$$

Donc, pour x et $y > x$ donnés, l'ensemble des valeurs de $((y-x)f(x)/4)^{s-1}$, s parcourant S , est borné supérieurement (par $f(y)/f(x)$). Puisque s peut tendre vers l'infini, on doit donc avoir $(y-x)f(x)/4 \leq 1$, autrement dit

$$f(x) \leq 4/(y-x).$$

Ceci est prouvé pour tout $y > x$. Comme y peut tendre vers l'infini, on doit avoir $f(x) = 0$, ce qui contredit (1).

A. Delcourt

5 Miscellaneous

Alexander von Humboldt Prize

Under the auspices of the "Fonds National de la Recherche Scientifique" (= Belgian NSF), the Alexander von Humboldt Prize for the period 2003–2004 and 2004–2005 has been conferred to Professor Dr. Dietmar VOGT from the University of Wuppertal. He will stay from April 1st to July 31st 2004 at the Institute of Mathematics of the University of Liège.

J. Schmets, J.Schmets@ulg.ac.be

A Belgian Member for ERCIM

Belgium is officially part of ERCIM since January 2004. After a decade of effort, this finally closes the curious “hole” in ERCIM’s map of Europe.

Belgium has no independent research center similar to CWI, SICS, or INRIA, and nothing similar to the “grandes écoles” in France. There are mainly universities, which are responsible for both education and research. They are organized independently by the French and Flemish communities. Research is coordinated by the FNRS (Fonds National de la Recherche Scientifique) for the French community and the FWO (Fonds voor Wetenschappelijk Onderzoek) for the Flemish community.

The Belgian membership is jointly sponsored by FWO and FNRS. This enables all Belgian research institutions to participate fully in ERCIM activities. The FWO has designated Bart De Moor of the Katholieke Universiteit Leuven as Belgian member of the Board of Directors, for an initial two year term. The FNRS has designated Peter Van Roy of the Université catholique de Louvain (UCL) as Belgian member of the Executive Committee, also for a two year term. Benoît Michel of UCL will be the first Belgian local editor of ERCIM News.

ERCIM is the European Research Consortium for Informatics and Mathematics. It aims to foster collaborative work within the European research community and to increase co-operation with European industry. Leading research institutes from eighteen European countries are members of ERCIM.

See <http://www.ercim.org/>.

6 Fiction

Mark Haddon *The curious incident of the dog in the night-time*, Jonathan Cape, 2002, ISBN 0224063782; a pocket edition by Red Fox, is expected in April.



Why mention this in this Newsletter? Well, it is the story of a fifteen years old boy that suffers from Asperger’s Syndrome (social and emotional disfunction characterised by mild autistic behaviour), who has a fascination for mathematics. The book is written from the viewpoint of the boy following some strange but ardent rules. He tries to solve the mystery of who has murdered his neighbour’s dog.

There are a lot of mathematical gimmicks and puzzles too: chapters are numbered according to prime numbers, population dynamics for animals (with graphs), Conway’s game of life (or a variant: Conway’s Soldiers) and the Monty Hall problem of the three doors, etc. Nothing really mathematically challenging (some solutions are discussed in an appendix) but still an illustration of “mathematics are everywhere”.

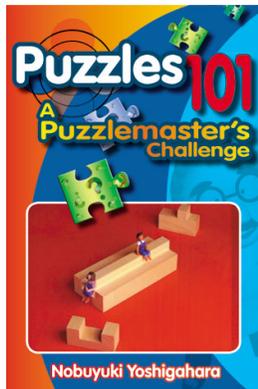
While the author brings a superb sketch of what kind of world an autistic boy is living in, unfortunately, it somehow also reinforces the stereotype that mathematics is part of that world and that mathematically gifted people are also social inadequate.

The 2003 Whitbread Book of the Year Award 2003 was won by Mark Haddon with his novel *The Curious Incident of the Dog in the Night-Time* (Jonathan Cape, 2002, ISBN 0224063782; a pocket edition by Red Fox, is expected in April). The announcement was made on 27 January in London. It is published in both an adult and a childrens version and has won numerous childrens and teenage fiction awards. It is the sixth novel to win the Book of the Year Award since 1985.

Paul Levrie

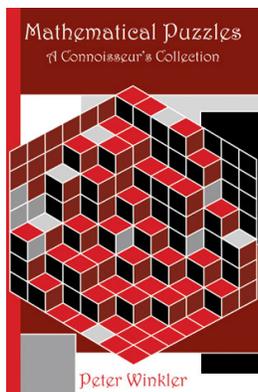
Nobuyuki Yoshigahara *Puzzles 101, A puzzlemaster's challenge*, A K Peters, Natick, MA, 2004, (paperback, 121p.) ISBN 1-56881-206-X, 14 USD.

Peter Winkler *Mathematical puzzles, A connoisseur's collection*, A K Peters, Natick, MA, 2004, (paperback, 163p.) ISBN 1-56881-201-9, 18 USD.



The group of “puzzle-masters”, i.e., those that really invent new (mathematical) puzzles is relatively small, yet, as Yashigahara writes in his preface, their creations, i.e., the puzzles, are spread by word from mouth to mouth and from generation to generation, just like sagas and fairy tales are, and they sink down in a collective memory and become elements in the recreational backpack of many who enjoy brain gymnastics. New puzzles, like jokes, spread across the world like an epidemic, and it is not always clear who the creator was and what the original version was like. Nowadays, the internet will contribute to archiving and spreading these brain teasers. In his book Yashigahara, collects 101 puzzles that he created or that he particularly liked. It is a mixture of easy and difficult, but always entertaining, problems. Knowledge of “real” mathematics is not necessary at all. Some of them are not even mathematical. For example: on a digital clock you may read 3:59:53 which is palindromic (ignoring the “:”). What are the two palindromic times that are nearest? Or an example of a non-mathematical one: can you find a caligraphic writing of the name of the author: Nobuyuki Yoshigahara

such that if you turn it upside down, it reads the same. All solutions are provided in the second half of the book. The format and size of the booklet is clearly adapted to the public that buys collections of cross-word puzzles in magazine shops and supermarkets.



The second book by P. Winkler is a bit more mathematical (but not always), although again no professional knowledge of mathematics is needed to solve the puzzles. Here it is a collection of about 100 puzzles. Not all of them are created by the author. If the source of the puzzle is known, it is mentioned. The criterions that the author used for selecting the puzzles are amusement (they should be entertaining; it is not a math test!), universality (they must rely on some general mathematical truth), elegance (they should be easy to formulate), difficulty (they should not be obvious), and solvability (at least one solution should exist that is easy to grasp). Obviously, the latter does not hold for the puzzles in the last chapter with a title “Unsolved puzzles”. The puzzles are organized in chapters classifying them loosely around some topic like numbers, games, geometry, etc. Solutions are given at the end of each chapter. The fact that there is an elegant solution does not mean that the puzzles are simple. On the contrary, some were open problems for a long time before somebody came up with the solution that is included. An sample puzzle is: how many times does one have to roll a die before all

six different numbers have shown up at least once? And a “non-mathematical” one: which two states contain the most distant points in the US? (The mathematics are hidden in the distance on the surface of a sphere.)

With these books many hours of puzzling pleasure is guaranteed. Solving one puzzle is a victory already. The one who can solve all these puzzles in his lifetime is a genius.

Adhemar Bultheel

7 The end . . .

“My life is arithmetic,” the young businesswoman explains. “I try to add to my income, subtract from my weight, divide my time, and avoid multiplying. . .”

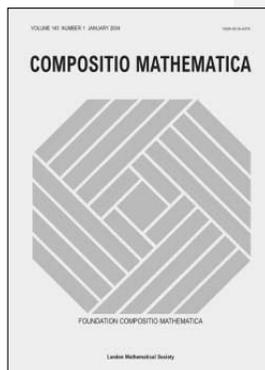
Mathematicians never die—they only lose some of their functions.

“Students nowadays are so clueless,” the math professor complains to a colleague. “Yesterday, a student came to my office and wanted to know if General Calculus was a Roman war hero. . .”

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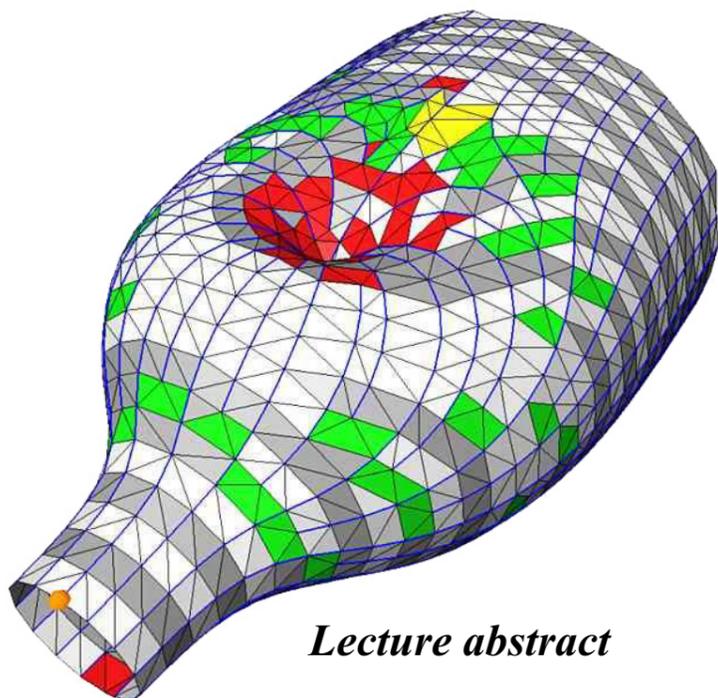
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SUMMER SCHOOL ON GEOMETRY AND VISUALIZATION

MAUBEUGE, FRANCE
JUNE 21-25, 2004



Lecture abstract

A. El Kacimi (Université de Valenciennes et du Hainaut-Cambrésis)

This part aims at casting a quick glance on some notions about differential geometry and algebraic topology: curvature (of curves and surfaces embedded in Euclidean space) and simplicial homology, with examples of calculations for the circle and compact orientable surfaces; the Euler-Poincaré Number will be introduced by homological as well as combinatorial methods.

H.C. Hege (Zuse Institute Berlin)

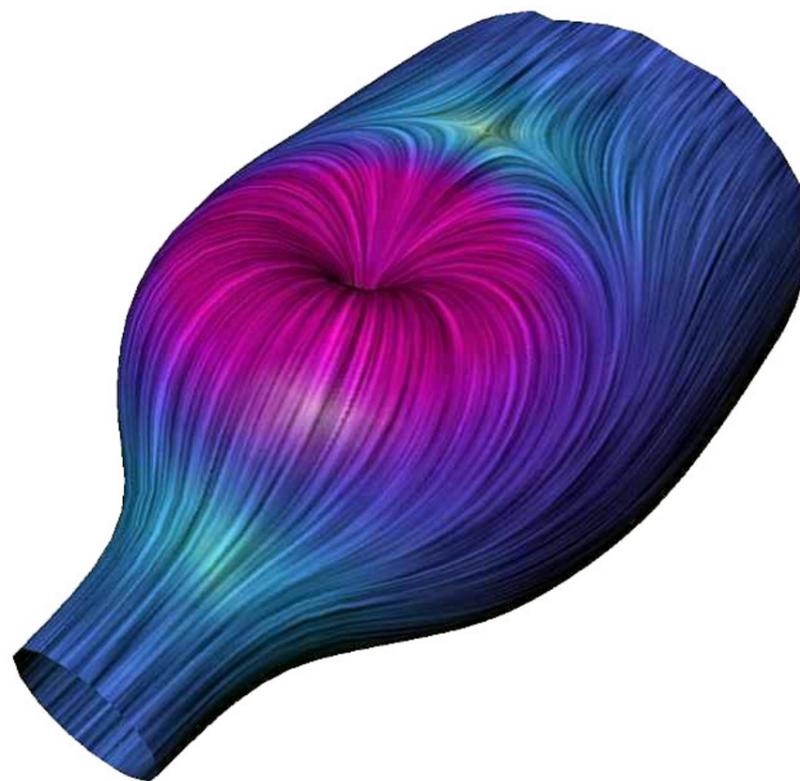
The lectures will focus on the notion and visualization of scalar, vector and tensor fields as well as reconstruction of geometries from 3D image data and the statistical analysis of shapes. All lectures will be illustrated by applications of visualization techniques in different scientific areas, mainly from biomedicine.

K. Polthier (Zuse Institute Berlin / TU-Berlin)

In recent years the Mathematics of polyhedral shapes has become an essential toolkit for the analytic study of meshes and the development of new algorithms in computer graphics and scientific visualization. These lectures will give an introduction to the discrete differential geometry of polyhedral meshes. The topics include, for example, discrete differential operators, discrete Gauss and mean curvature, discrete vector fields and differential forms, energy based optimization techniques for curves and surfaces, smoothing of noisy meshes, numerical minimization techniques. Applications will cover a wide range from mathematical visualization and online visualization to optimization techniques in CAD.

The summer school will provide a concise introduction to the mathematical foundations of visualization techniques as well as to real-world applications of visualization techniques in different scientific areas. The theoretical part of the summer school focuses on fundamental topics from differential to discrete geometry, which play an essential role in the study of polyhedral shapes. Modern visualization algorithms will be introduced and complemented with hands-on experiments in the practical part.

Lectures and practical exercises are intended for students majoring in computer science and mathematics as well as other scientific subjects like physics, chemistry, biology and medicine with Master's degree level knowledge in differential geometry, and for professionals using visualization technologies. Numerous applications will provide an informative overview of current visualization techniques.



Information

Concerning the courses: aekacim@univ-valenciennes.fr

Concerning the organisation of the summer school: v.vaillant.adus@free.fr or (00 33)3 27 53 01 35

Reservation before May 14, 2004 ; free lodging.

International Solvay Institutes

SYMPOSIUM HENRI POINCARÉ

8-9 October 2004

Université Libre de Bruxelles, Campus Plaine, Boulevard du Triomphe, B-1050 Brussels, Salle Solvay,
Building NO, 5th Floor

The International Solvay Institutes for Physics and Chemistry wish to commemorate the 150th anniversary of the birth of Henri Poincaré by organizing an international symposium on historical and current aspects of his scientific legacy. This event will be organized in close collaboration with the two Brussels Universities (ULB and VUB).

Scientific Committee

Damour Thibault (IHES, Bures-sur-Yvette, France)
Faddeev Ludwig (Steklov Math. Inst., St. Petersburg, Russia)
Gaspard Pierre (ULB, Belgium)
Henneaux Marc (ULB, Belgium)
Lambert Franklin (VUB, Belgium)
Mawhin Jean (UCL, Belgium)

Programme

Friday 8 October

09:30

Opening of the symposium

Chair:

Pierre Marage (ULB, Belgium)

09:50 – 10:40

Jean Mawhin (UCL, Belgium)

10:40 – 11:00

Coffee break

11:00 – 11:50

Sergei Novikov (Univ. Maryland, USA and

Landau Institute Moscow, Russia)

11:50 – 12:40

*Simon Donaldson (Imperial College, UK)

12:40 – 14:15

Lunch

Chair:

Viviane Pierrard (IASB, Belgium)

14:20 – 15:10

Dmitrii Anosov (Steklov Math. Inst., Moscow, Russia)

15:10 – 16:00

Thibault Damour (IHES, Bures-sur-Yvette, France)

16:00 – 16:30

Tea break

16:30 – 17:20

Ludwig Faddeev (Steklov Math. Inst., St. Petersburg, Russia)

17:20 – 18:10

Henk Broer (Universiteit Groningen, Netherlands)

Saturday 9 October

Chair:

Adhemar Bultheel (KULeuven, Belgium)

10:00 – 10:50

*Jean Bourgain (Inst. Adv. Stud. Princeton, USA)

10:50 – 11:20

Coffee break

11:20 – 12:10

Leonid Shilnikov (Nizhnii Novgorod State Univ., Russia)

12:10 – 13:00

Jacques Laskar (Bureau des Longitudes, Paris, France)

13:00 – 14:30

Lunch

Chair:

Grégoire Nicolis (ULB, Belgium)

14:30 – 15:20

*Jean-Pierre Serre (Collège de France, France)

15:20 – 16:10

Jean Reignier (VUB/ULB, Belgium)

16:10 – 17:00

Pierre Gaspard (ULB, Belgium)

17:00

Closure of the Symposium

* Still to be confirmed on 05/05/2004.



IVth International Workshop on Functional Analysis

September 5-9, 2005

First announcement, January 30, 2004

Dear Colleague,

We would like to inform you that the Fourth International Workshop on Functional Analysis will take place from September 5th to 9th, 2005 this time not at Trier University, but at the University of Liège (more precisely at the Domaine du Rond-Chêne, Esneux) and it will be dedicated to Professor Jean Schmets on the occasion of his 65th birthday.

We would like to invite you to participate in the Workshop.

More information about the organization (lectures, accomodation, meals, fees etc ...) will be given in a second announcement towards the end of 2004 (see also the pages <http://www.ulg.ac.be/sectmath/act.html>).

Registration by email is possible from now on at the following address:

wengen@uni-trier.de

The organizers,

F. Bastin

S. Dierolf

J. Wengenroth