

BELGIAN MATHEMATICAL SOCIETY

Comité National de Mathématique CNM

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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

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No 99, September 15, 2014

Letter from the editor



*Welcome to this September edition of our Newsletter.
Have a nice semester!*

Regards, Françoise

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1 News from the BMS & NCM

1.1 Future activity: November 12, 2014

The *Fields Medal*, officially known as International Medal for Outstanding Discoveries in Mathematics, is a prize awarded to two, three, or four mathematicians not over 40 years of age at each International Congress of the International Mathematical Union (IMU), a meeting that takes place every four years. *In August 2014, this IMU meeting has been organized in Seoul, Korea.*

The Fields Medals were awarded to Artur AVILA, Manjul BHARGAVA, Martin HAIRER and Maryam MIRZAKHANI. See at the pages <http://www.mathunion.org/general/prizes/2014>

On Wednesday November 12, 2014, at the Academy,

the BMS and the NCM will organize some lectures around the themes of the fields medalists. *Please remember this and fix the date in your agenda!*

1.2 Important General Assembly: November 12, 2014

Please note that the *General Assembly of the BMS* will also take place on November 12, 2014. Important matters related to the Executive Committee will be discussed (President, Vice-President, Treasurer, Secretary, new members, ...)

1.3 Bulletin of the BMS - electronic version

We remind you that it is possible to convert your paper subscription to the Bulletin of the BMS into **the electronic version of the Bulletin**. *If you are interested, please contact Philippe Cara by e-mail* (pcara@vub.ac.be with bms@ulb.ac.be in cc) for details.

You will receive a special “subscriber code” with which you can register for the Bulletin of the Belgian Mathematical Society at Project Euclid (<http://projecteuclid.org>).

2 Meetings, Conferences, Lectures

2.1 October 2014

Colloquium CATALAN
University of Liège, October 14-15, 2014

See the announcement at the end of this Newsletter.

2.2 November 2014

Around the Fields Medalists
Academy, Brussels, November 12, 2014

See also the announcement in the section “BMS & NCM”.

The following speakers have confirmed:

- A. Papadopoulos (about the work of Mirzakhani)
- L. Zambotti (about the work of Hairer).

We are waiting for definitive answer from A. Avila.

More information will soon be available and sent in a separate message.

3 PhD theses

Regularity of functions: Genericity and multi fractal analysis

Céline Esser, FNRS, University of Liège

Date: October 22, 2014

Thesis advisor: F. Bastin (ULg)

Summary

As surprising as it may seem, there exist functions of $C^\infty(\mathbb{R})$ which are nowhere analytic. When such an unexpected object is found, a natural question is to ask whether many similar ones may exist. A classical technique is to use the Baire category theorem and the notion of residuality. This notion is purely topological and does not give any information about the measure of the set of objects satisfying such a property. In this purpose, the notion of prevalence has been introduced. Moreover, one could also wonder whether large algebraic structures of such objects can be constructed. This question is formalized by the notion of lineability.

The first objective of the thesis is to go further into the study of nowhere analytic functions. It is known that the set of nowhere analytic functions is residual and lineable in $C^\infty([0, 1])$. We prove that the set of nowhere analytic functions is also prevalent in $C^\infty([0, 1])$. Those results of genericity are then generalized using Gevrey classes, which can be seen as intermediate between the space of analytic functions and the space of infinitely differentiable functions. We also study how far such results of genericity could be extended to spaces of ultradifferentiable functions, defined using weight sequences or using weight functions.

The second main objective is to study the pointwise regularity of functions via their multifractal spectrum. Computing the multifractal spectrum of a function using directly its definition is an unattainable goal in most of the practical cases, but there exist heuristic methods, called multifractal formalisms, which allow to estimate this spectrum and which give satisfactory results in many situations. The Frisch-Parisi conjecture, classically used and based on Besov spaces, presents two disadvantages: it can only hold for spectra that are concave and it can only yield the increasing part of spectra. Concerning the first problem, the use of \mathcal{S}^ν spaces allows to deal with non-concave increasing spectra. Concerning the second problem, a generalization of the Frisch-Parisi conjecture obtained by replacing the role played by wavelet coefficients by wavelet leaders allows to recover the decreasing part of concave spectra.

Our purpose in this thesis is to combine both approaches and define a new formalism derived from large deviations based on statistics of wavelet leaders. As expected, we show that this method yields non-concave spectra and is not limited to their increasing part. From the theoretical point of view, we prove that this formalism is more efficient than the previous wavelet-based multifractal formalisms. We present the underlying function space and endow it with a topology.

4 From the EMS

Dear Colleagues,

The June issue of the Newsletter is on line: <http://www.ems-ph.org/journals/journal.php?jrn=news>

Best regards
Lucia Di Vizio

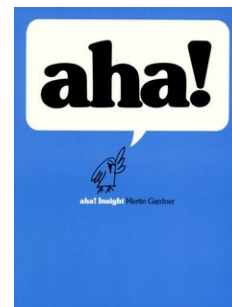
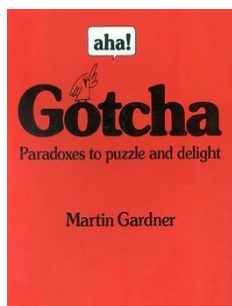
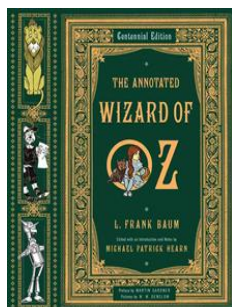
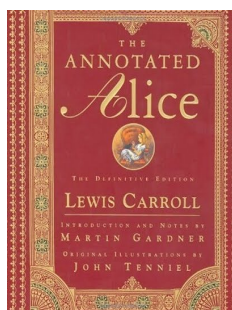
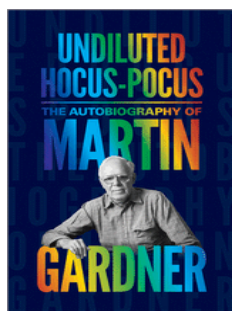
5 History, maths and art, fiction, jokes, quotations . . .

As usual, please find here some reviews from A. Bultheel.

About Martin Gardner :

Martin Gardner has contributed enormously to the popularization of mathematics. It started with his mathematical columns in "Scientific American" in the period 1956-1981 and he has written some hundred books. He was born on October 21, 1914, which makes this year a centennial Gardner year. He passed away on May 22, 2010.

Undiluted Hocus-Pocus. The autobiography of Martin Gardner, 2013, Princeton University Press, ISBN 978-0691-1-5991-1 (hbk), xxvii+233 pp. by *Martin Gardner*.



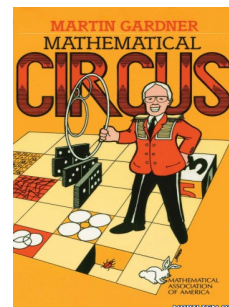
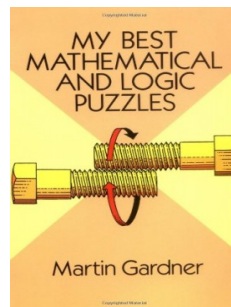
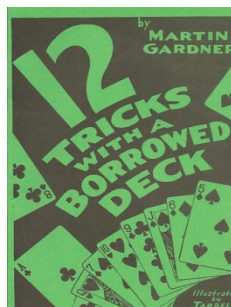
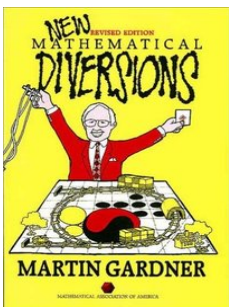
Martin Gardner (1914-2010) hardly needs any introduction in a review intended for mathematicians. His popularity, even among a broader public, has grown to a legendary level. His interests, reflected in his numerous publications, have created a loyal circle of followers among the species of homo ludens that consists of geeky lovers of recreational mathematics, card tricks, and other magic hocus-pocus, addicted by his *Mathematical Games* in *Scientific American* in the period 1952-1981. Some may know about his admiration for Lewis Carroll via his edition of *The Annotated Alice* (1960) and for L. Frank Baum's Wizard of Oz via his book *Visitors From Oz* (1998). These were inspirational for many other of his writings as well. Perhaps a bit less known is that he was also a big fan of G. K. Chesterton (the author of the Father Brown detective stories).

The covers of some of his books are decorating this review, but there are a great many more. As he writes himself: ‘...I’ve found time to come close to a hundred if you count booklets under a hundred pages. The count is still higher if it includes books for children, and books for magicians.’ His *Mathematical Games* columns are also bundled in books¹.

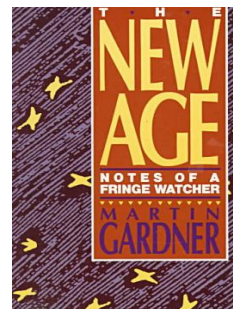
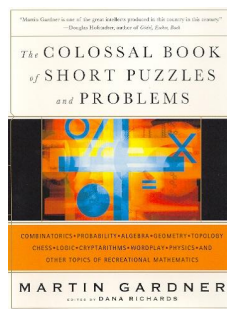
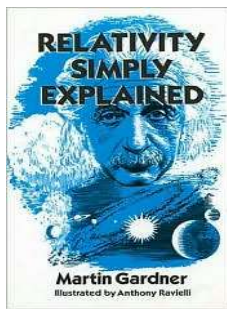
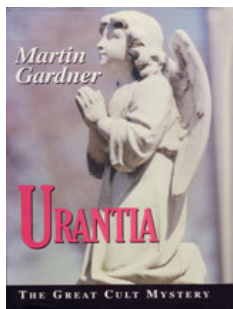
His *Scientific American* columns are already a while ago, so this book might reintroduced Gardner to the younger generation. But even for the older generation, if these columns are about as far as your familiarity with Martin Gardner’s work goes, then this autobiography will bring some surprises. It is not revealing unexpected issues about his private life, but it will be an eye-opener knowing that he was active on so many diverse fields outside the ones listed above.

Clearly he has been interested in magic, chess, card games, and all kinds of recreational mathematics since he was a young boy. But the opening chapter e.g. is about colours, and Gardner immediately connects this with colours in the Wizard of Oz and in Chesterton’s novels. This is very typical. Whatever the topic or the period in his life is covered in the different chapters, there are always numerous references to and citations from books by others and of course also by himself. His opinion about some poetry and more in general about other art forms is outspoken and clearly put on display.

God and religion mattered a lot to him. After going through several stages in his life, he finally became a believer in God and in an afterlife, although not on a rational basis. This issue is recurrent throughout the



¹There are 15 volumes, made available on cd in 2008 by the *Mathematical Association of America* and revisions being republished by the MAA in collaboration with Cambridge University Press in *The New Martin Gardner Mathematical Library* series.



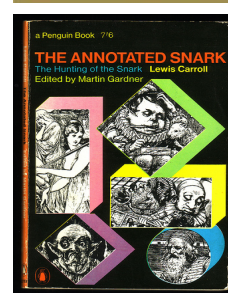
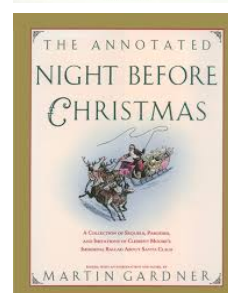
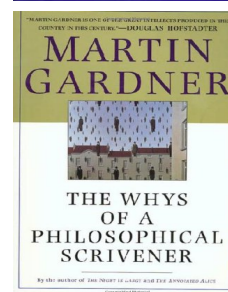
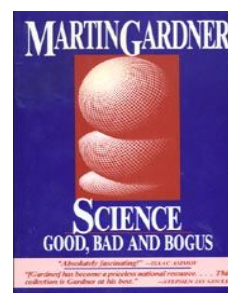
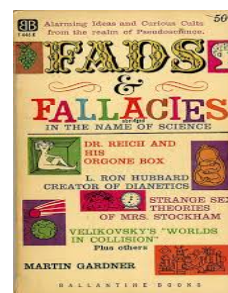
book. He has a chapter on loosing his faith, and is explicit in the penultimate chapter on ‘God’ and in the last one where he summarizes his philosophy as a kind of testament for posterity.

Another of his pet subjects is his aversion for pseudoscience. There is a separate chapter on his rejection of what he calls ‘bad science’. There is no mercy for Dianetics and Scientology, orgonomy, UFOs, homeopathy, chiropractors, phrenology, palmistry etc. or for frauds like Uri Geller. On this topic, his book *Fads and fallacies in the name of science* (1958) originally published with a different title in 1952 has become a classic.

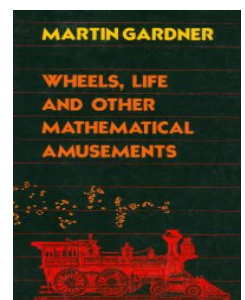
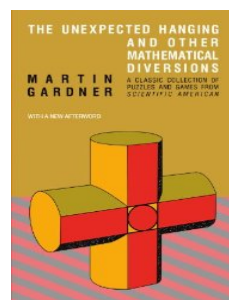
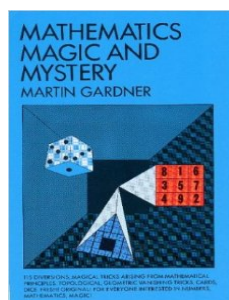
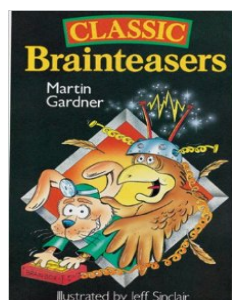
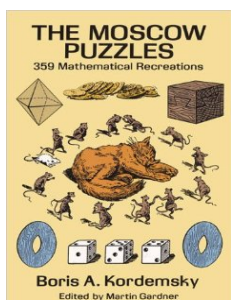
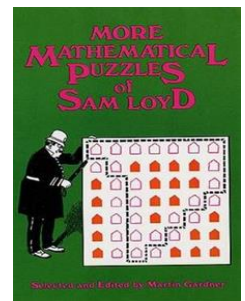
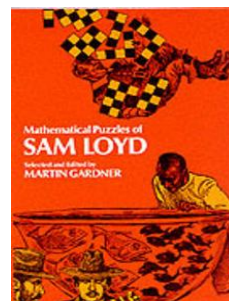
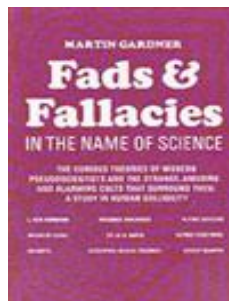
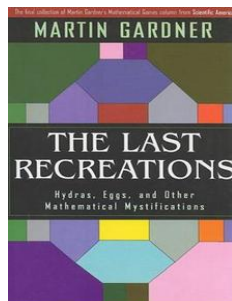
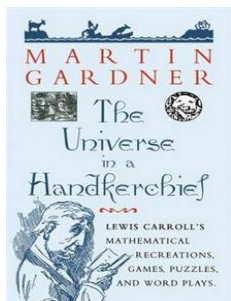
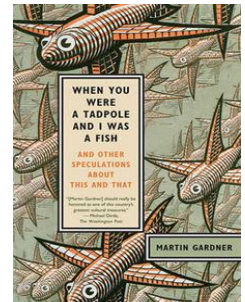
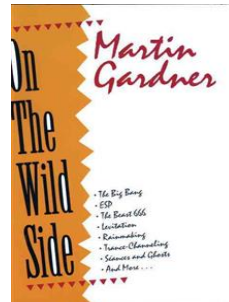
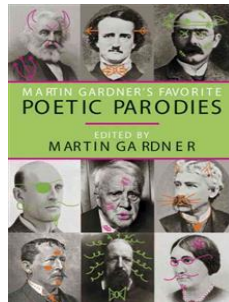
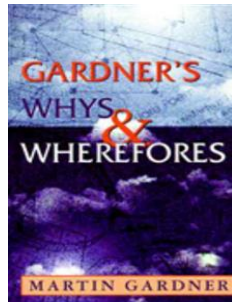
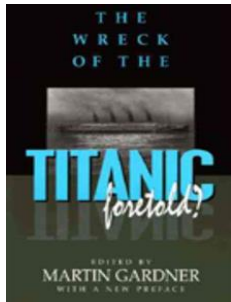
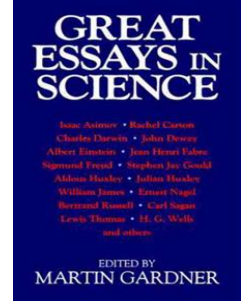
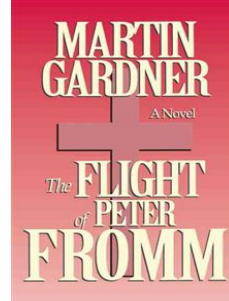
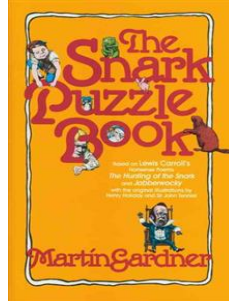
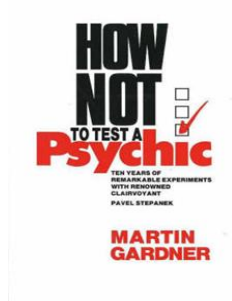
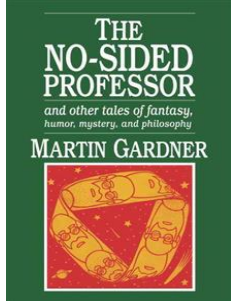
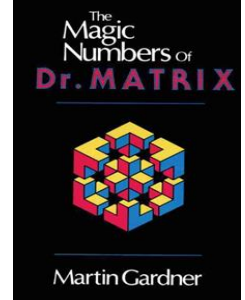
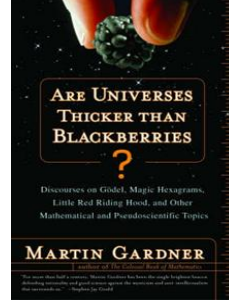
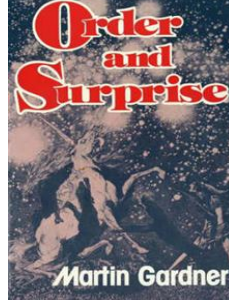
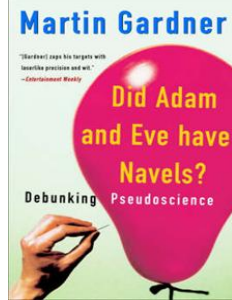
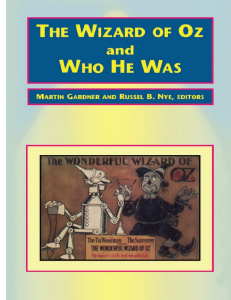
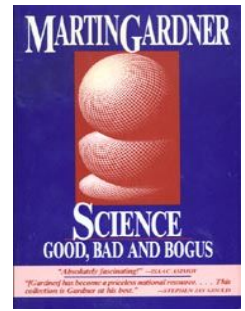
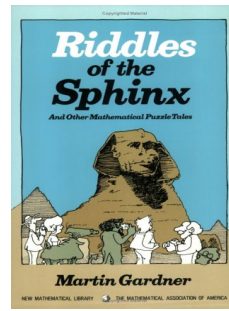
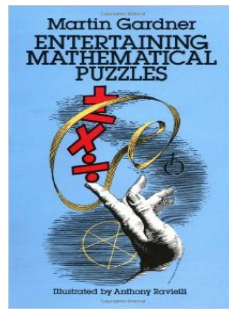
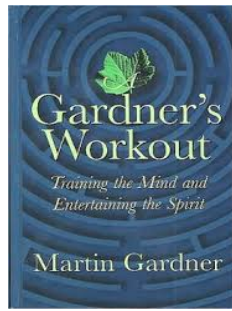
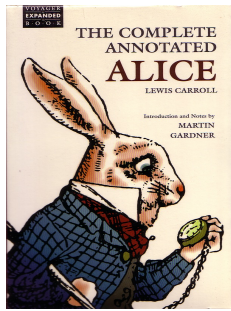
Almost ‘between the lines’ we learn about his life: his schools, the University of Chicago, his service in the Navy during WW II and later his career as a contributor to *Esquire*, editor of *Humpy Dumpty* and how it really was taking off when he published his first contribution to *Scientific American* on flexagons. Obviously there is also a chapter about his parents, one about his wife and family, and one about good friends. However, these are not digging very deeply into the lives of these people. Even in these chapters, he finds hooks to his views and convictions and to his or somebody else’s publications. The chapter on his math and magic friends has a lot of anecdotes, but there is a constant stream throughout the chapters with amazing details and funny stories about an endless number of people he has known or worked with and who often became friends. The list of names and the list of works compiled in the index at the end of the book is 19 pages long. That is a lot of people on only 200 pages. That Salvador Dali was one of his fans will be a surprise for many. You will also learn that Martin Gardner has been the inspiration for others like an ashtray design by Dali. A ‘photo essay’ has 24 pages of photographs and illustrations including some of the caricatures he made, showing another of his skills as yet undiscussed.

So lovers of mathematical games and recreations should not look for more of this stuff here. Nevertheless, with the many references and citations, they can consider it as an annotated (although incomplete) guide to the work of Gardner. Moreover they will be surprised that there are so many probably unexpected facets to this man. Martin Gardner will live on in the biannual G4G² (Gatherings for Gardner) that started in 1993. His broad mathematical impact may be explained just because he never got a formal degree in mathematics. As he confesses that he sometimes had to work hard to understand the subject himself before he could write about it, implying that if he understood, then also other interested but non-mathematical readers would understand what he wanted to communicate.

Adhemar Bultheel



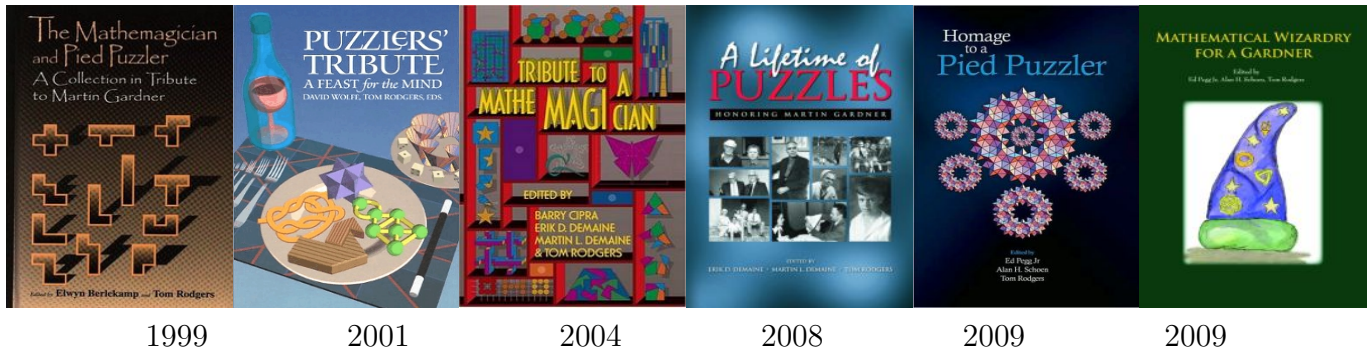
²<http://gathering4gardner.org/the-gathering-4-gardner/>



The Mathematician and the Pied Puzzler, 1999, AK Peters, ISBN 978-1-56881-204-5 (hbk), x+266 pp. by *Elwyn R Berlekamp and Tom Rodgers* (eds.)

A lifetime of puzzles. Honoring Martin Gardner, 2008, AK Peters, ISBN 978-1-56881-245-8 (hbk), x+349 pp. by *Erik D. Demaine, Martin L. Demain, Tom Rodgers* (eds.)

Mathematical wizardry for a Gardner, 2009, AK Peters, ISBN 978-1-56881-447-6 (hbk), xx+262 pp. by *Ed Pegg Jr., Alan H. Schoen, Tom Rodgers* (eds.)

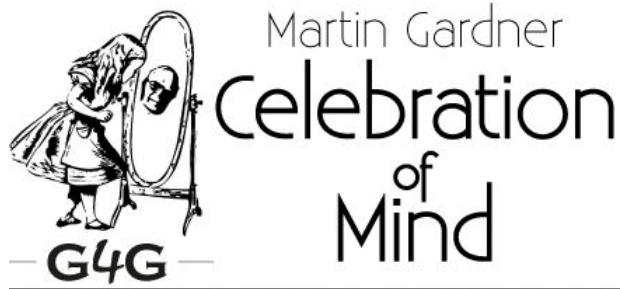


Martin Gardner (1914-2010) has popularized mathematics through his many books and columns where he promotes the application of mathematics for recreational purposes. He invented new games, mathemagical tricks, new constructs like flexagons, etc. He has inspired a whole generation to enjoy mathematics. Thomas M. Rodgers (1943-2012), an enthusiastic puzzler took the initiative in 1993 to bring a bunch of fellow puzzle freaks, mathematicians and magicians together. This is bookmarked as the first *Gathering for Gardner* (G4G1). In 2007 a non-profit organization was formed: the *Gathering 4 Gardner, Inc.*. This organization wants to honor and promote Martin Gardner's work and ideas. One of the activities is to organize these G4G meetings that has now become an annual event (the G4G11 is organized in Atlanta, GA in March 2014). On or around 21 October (M. Gardner's birthday) local events are set up all over the world on the topic which is called *Celebration of Mind*.



Another activity is the editing and publication of books on these topics of interest to their members. Six books are mentioned on their website, of which the covers are displayed above (with the date of publication). All of them are published that is a division of Taylor & Francis.

by A K Peters, now a sub-company of CRC Press
 The pdf of the first book *The Mathematician and the Pied Puzzler* is freely available¹ courtesy of CRC Press. It basically consists of the proceedings for the G4G1 and it consists of three parts. In the first part some texts are devoted to Martin Gardner. The other two parts are much more extensive. The second is a collection of contributions by puzzlers (Donald Knuth is one of them) and there is a proposal for a classification system for mechanical puzzles and related puzzle objects. The third part groups the mathemagical subjects such as logical paradoxes, graphs, the game of life (automata), 3D mazes, optical problems with mirrors, Diophantine problems, etc.



The second book *Puzzlers' tribute. A feast for the mind* was briefly reviewed in this Newsletter (issue 43, May 2003). It contains the proceedings of the G4G2, G4G3 and G4G4. Also the third one *Tribute to a mathemagician* has been considered more extensively in this Newsletter (issue

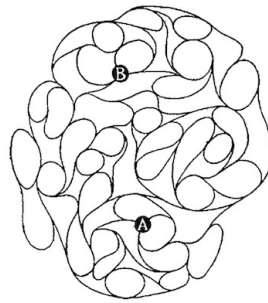
¹gathering4gardner.files.wordpress.com/2012/04/mathematicianpiedpuzzler.pdf

52, March 2005). It contains the proceedings of the G4G5 held in 2004.

Here I will have a closer look at books 4 and 6 that I have now in front of me. *A lifetime of puzzles. Honoring Martin Gardner* has 25 articles dedicated to Martin Gardner's 90th birthday and edited by Tom Rodgers (G4G puzzler of the first hour) together with father and son Martin and Erik Demaine (both lovers of mathematical art and puzzles, the latter a child prodigy and professor Computer Science at MIT²). Obviously in this volume, there are again articles about Martin Gardner, but they also succeeded in convincing many more contributors among which Colm Mulcahy, Persi Diaconis, Raymond Smullyan, Roger Penrose, Jerry Slocum, etc. There are historical papers on tangrams and on Luca Paciolo (a collaborator of Leonardo da Vinci). A diversity of papers discuss mazes and mechanical puzzles, burr puzzles, computer assisted mosaic portraits, tennis tournament scheduling, word games, etc. Most of the contributions are organized like research papers: some even got proofs and almost all have a reference list.



Luca Pacioli



railway mase



burr puzzles

The *Mathematical Wizardry for a Gardener* is the last in the row and together with the previous *Homage to a Pied Puzzler* it has mostly contributions from the G4G7 in 2006. It has two papers commemorating Frank Harary (1921-2005), a mathematician who specialized in graph theory and an excellent ambassador of mathematics for the non-mathematician. The remaining papers shows the usual mixture of puzzles and fun stories with a mathematical flavour. Subjects are for example the Ig Nobel prizes, paper folding, anamorphoses (extreme transformations that appeared in Renaissance paintings), board games, sphere packing, uncountable sets, graph-based games, spherical calculus, and two- and three-dimensional geometric puzzles.



Spherical weaving



Jordan curve



anamorphose

The subjects are too diverse to be discussed in detail here, but it should be clear what kind of topics are treated. Precisely the topics that also were so dear to Martin Gardner. There is no better way to honor and remember him. These are must-have books for anyone who is interested in recreational mathematics or anyone who enjoys being surprised by the fun and the beauty that mathematics can bring and you certainly don't have to be a mathematician for that.

Adhemar Bultheel

²He gave the Francqui lectures in Belgium in 2009.

Colloquium Catalan

University of Liège

14-15 October 2014

Eugène Catalan was professor at the University of Liège from 1865 till his retirement in 1884. His conjectures in number theory received a lot of attention in the literature, some of them having been proved only quite recently.



Figure 1: Eugène Catalan – ©Collections artistiques de l'Université de Liège

The year 2014 celebrates the 200th anniversary of his birth. On that occasion, the Mathematics Department of ULg organises a two-day meeting made of a scientific colloquium on Tuesday 14 October and a vulgarization conference (in French) dedicated to secondary school students on Wednesday 15 October.

The program of these two days is outlined below and more information may be found on the web site <http://www.deptmath.ulg.ac.be/catalan/>. Everyone is welcome. Registration is free but compulsory (register by sending an email to D.Bartholomeus@ulg.ac.be). Certification of attendance may be provided upon request for PhD students.

Tuesday 14 October 2014

Venue: Amphitéâtre 01, Institut de Mathématique, B37, 12 Grande Traverse, B-4000 Liège

- 14.00 - 14.15 Welcome address
Prof. A. Corhay, Rector of the University of Liège
- 14.15 - 15.00 *Historical perspectives about the research of Eugène Catalan*
Catherine Goldstein (CNRS, Institut de mathématiques de Jussieu-PRG)
- 15.00 - 15.45 *Conceiving and Solving a Conjecture: The Case of Catalan's Conjecture*
Preda V. Mihailescu (University of Gottingen)
- 15.45 - 16.15 Coffee Break
- 16.15 - 17.00 *Exponential Diophantine equations*
Yann Bugeaud (University of Strasbourg)
- 17.00 - 17.30 *The philosophical and political commitments of Eugène Catalan*
Jan Vandersmissen (Centre d'histoire de l'ULg)
- 17.30 Drink offered by the Department of Mathematics

During the coffee break and the drink, some original correspondance between Catalan and other wellknown mathematicians of his time (A. Cayley, E. Cesaro, Ch. Hermitte, P. Mansion,...) will be displayed.

Wednesday 15 October 2014

Venue: Amphithéâtre de Zoologie, Quai Van Beneden, B-4000 Liège

- 9h00 - 9h15 Welcome address
Prof. P. Mathonet, President of the Mathematics Department
- 9h15 - 10h15 *L'harmonie des nombres : deux variantes anciennes de la conjecture de Catalan*
Benoît Rittaud (Université Paris-13, Sorbonne-Paris-Cité)
- 10h15 - 10h30 Break
- 10h30 - 11h15 *Des solides de Platon aux polyèdres de Catalan*
Pierre Lecomte (ULg)
- 11h15 - 12h00 *Nombres de Catalan: alcool, ruine et probabilités*
Yvik Swan (ULg).