

Newsletter

BELGIAN MATHEMATICAL
SOCIETY

100, November 15, 2014

Comité National de Mathématique CNM



NCW Nationaal Comité voor Wiskunde

Newsletter of the Belgian Mathematical Society and the National Committee for Mathematics

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From the editor



Welcome to this November edition of our Newsletter.

This is issue 100 of the Newsletter, a special one. We provide important information about the Belgian Mathematical Society and its activities.

Have a nice "December-time". Happy New Year!!

Regards,
Françoise

1 News from the BMS & NCM

1.1 Fields Medallists Symposium

A few days ago (November 12) we had a successful symposium on the mathematics of the Fields Medal winners of 2014. More than 100 participants registered and the room we had booked at the Palace of the Academies in Brussels had become too small. On short notice we had to look for an alternative location, which we found at the Vrije Universiteit Brussel (VUB).

The invited speakers were Athanase Papadopoulos (Université de Strasbourg), Lenny Taelman (Universiteit van Amsterdam), Sylvain Crovisier (Université d'Orsay Paris-Sud) and Lorenzo Zambotti (Université Pierre et Marie Curie, Paris VI).

Thanks to all participants and to the 4 speakers for this wonderful afternoon!

1.2 General Assembly of the BMS: November 12, 2014

The general assembly of the BMS was held on the same day as the Fields Medallists Symposium.

During this general assembly, the president gave an overview of the past and future activities of our Society and introduced the *Steering Committee*. This is a small committee which will launch new initiatives and streamline the Society. More details in section [1.3](#).

A new executive committee of the society was elected (January 2015 – December 2015). Here is the list of the members (alphabetical order):

- Françoise Bastin, ULg (President, Editor of the Newsletter)
- Kouyider ben Naoum, UCL
- Pierre Bielavisky, UCL
- Denis Bonheure, ULB
- Adhemar Bultheel, KUL

- Stef Caenepeel, VUB (Editor in Chief of the Bulletin)
- Pierre-Emmanuel Caprace, UCL
- Philippe Cara, VUB (Vice-President, Webmaster)
- Camille Debiève, UCL (Managing Editor of the Bulletin)
- Karel de Kimpe, KUL-Kortrijk
- Peter De Maesschalck, UHasselt (Secretary)
- Catherine Finet, UMONS
- Gentine Haesbroeck, ULg
- Renaud Lambiotte, FUNDP
- Pascal Lambrechts, UCL (Editor of the book reviews)
- Christian Michaux, UMONS
- Hendrick Van Maldeghem, UGent
- Jean Van Shaftingen, UCL
- Stefan Vaes, KUL
- Guy Van Steen, UA (Treasurer)
- Leo Storme, UGent
- Yvik Swan, ULg
- Jost Verduyck, ULB
- Jason Vindas, UGent
- Andreas Weiermann, UGent

1.3 The Steering Committee

On August 26, 2014, there was a meeting of the executive committee of our Society where several mathematicians from Belgian departments were invited although they were not on the executive committee.

During that meeting it was decided to create a new committee to reflect on the future of the Society and especially what the Society can do for its younger members.

The members of the Steering Committee are:

- Pascal Lambrechts (UCL)
- Peter De Maesschalck (UHasselt)
- Yvik Swan (ULg)
- Jason Vindas (UGent)
- Renaud Lambiotte (FUNDP)
- Philippe Cara (VUB)

The committee had its first meeting on September 13, 2014 and brainstormed about the following ideas.

Visibility of the BMS. The Society should be more visible in the media. The Society should have an opinion on current issues related to mathematics. This opinion should be communicated to press and other media! *For this we need members who watch the press and other media and react quickly.*

Centralized calendar of math events. The Society should help the Math departments to advertise their seminars, colloquia, conferences, ... Our current website contains an [Announcements](#) tab with the offer to communicate activities. Very few colleagues ask us to announce their activities on the website. Once an activity is communicated to the webmaster, it has to be put online by hand. More efficient methods to create activity calendars are available nowadays. We could aggregate (Google) calendars of the Belgian Math departments and publish this on the website. *For this we have to convince the institutes to use an automated calendar and to share it with us.* Once we have the information, we could for example tweet announcements and reminders!

Social media. We think the BMS has to be present on social media. This channel can be used to announce conferences and events, put interesting papers of our members in the spotlight or put members in the spotlight. A more attractive website is also desirable.

Social events for members. We already organise symposia, PhD days, ... which bring mathematicians together and provide an opportunity to encounter colleagues of other institutes. More such occasions should be generated. We think of debates about current issues in education and research funding, mathematical games, quizzes, walks, movies, ... There is a project to organise such an event around the movie [The Imitation Game](#) in the first quarter of 2015. This is a movie about Alan Turing.

Contacts with Math teachers. We should organise joint events with Math teacher's associations like [SBPMef](#), [VVWL](#), ... Some of our members go to highschools from time to time to give talks about Mathematics. We would like to keep a central list of such talks and put interested schools in contact with the appropriate colleague.

Contacts with industry. Some of our members are in industry. We should identify them and involve them!

How can you help us? Please feel free to comment on the above topics or make other propositions! If you have connections with the press, politicians, owners of movie theatres, ..., please share these with us! You can send all your comments or suggestions to Philippe Cara <pcara@vub.ac.be>.

2 Meetings, Conferences, Lectures

2.1 January 2015

BL-PRO15 Belgo-Luxemburgish PRObability days
University of Liège, January 29-30, 2015

What:

A two day workshop dedicated to showcase Belgian and Luxemburgish research in probability theory. Over the two days 7 talks will be delivered by internationally renowned experts, and lots of room will be left for discussion and socialising. The workshop is of particular interest to PHD students and PostDocs both in probability and statistics, as it is opened and closed by two 2-hour short courses specifically tailored for their needs. The first course (delivered by Ivan Nourdin) will have a probabilistic flavour, while the last course (delivered by Stéphane Boucheron) will have a statistical flavour.

Who:

Organised by Giovanni Peccati (ULux) and Yvik Swan (ULg)

Topics: Baeyesian networks, compressed sensing, concentration, queuing theory, random matrices, random planar graphs, stochastic geometry, stochastic homogenisation, ...

Attendance is free but registration is mandatory : send an email to yswan@ulg.ac.be.

Webpage : <https://sites.google.com/site/yvikswan/bl-pro15> (still under construction)

Confirmed speakers : Stéphane Boucheron (Paris 7), Antoine Gloria (ULB), Guy Latouche (ULB), Ivan Nourdin (ULux), Pierre Patie (Cornell)

3 PhD theses

Contributions to combinatorics on words in an abelian context and covering problems in graphs

Elise Vandomme, University of Liège

Date and place: January 7, 2015, 14:00, Insitute of Mathematics, ULg

Thesis advisors: S. Gravier (Grenoble) and M. Rigo (Liège)

Summary

This dissertation is divided into two (distinct but connected) parts that reflect the joint PhD. We study and we solve several questions regarding on the one hand combinatorics on words in an abelian context and on the other hand covering problems in graphs. Each particular problem is the topic of a chapter.

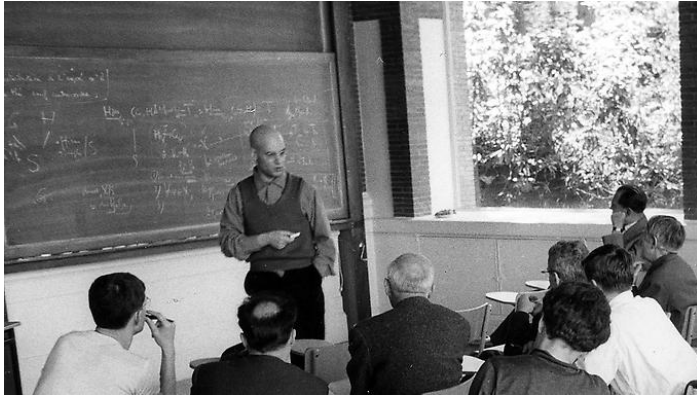
In combinatorics on words, the first problem considered focuses on the 2-regularity of sequences in the sense of Allouche and Shallit. We prove that a sequence satisfying a certain symmetry property is 2-regular. Then we apply this theorem to show that the 2-abelian complexity functions of the Thue–Morse word and the period-doubling word are 2-regular. The computation and arguments leading to these results fit into a quite general scheme that we hope can be used again to prove additional regularity results. The second question concerns the notion of return words up to abelian equivalence, introduced by Puzynina and Zamboni. We obtain a characterization of Sturmian words with non-zero intercept in terms of the finiteness of the set of abelian return words to all prefixes. We describe this set of abelian returns for the Fibonacci word but also for the Thue–Morse word (which is not Sturmian). We investigate the relationship existing between the abelian complexity and the finiteness of this set.

In graph theory, the first problem considered deals with identifying codes in graphs. These codes were introduced by Karpovsky, Chakrabarty and Levitin to model fault-diagnosis in multiprocessor systems. The ratio between the optimal size of an identifying code and the optimal size of a fractional relaxation of an identifying code is between 1 and $2 \ln(|V|) + 1$ where V is the vertex set of the graph. We focus on vertex-transitive graphs, since we can compute the exact fractional solution for them. We exhibit infinite families, called generalized quadrangles, of vertex-transitive graphs with integer and fractional identifying codes of order $|V|^\alpha$ with $\alpha \in \{1/4, 1/3, 2/5\}$. The second problem concerns (r, a, b) -covering codes of the infinite grid already studied by Axenovich and Puzynina. We introduce the notion of constant 2-labellings of weighted graphs and study them in four particular weighted cycles. We present a method to link these labellings with covering codes. Finally, we determine the precise values of the constants a and b of any (r, a, b) -covering code of the infinite grid with $|a - b| > 4$. This is an extension of a theorem of Axenovich.

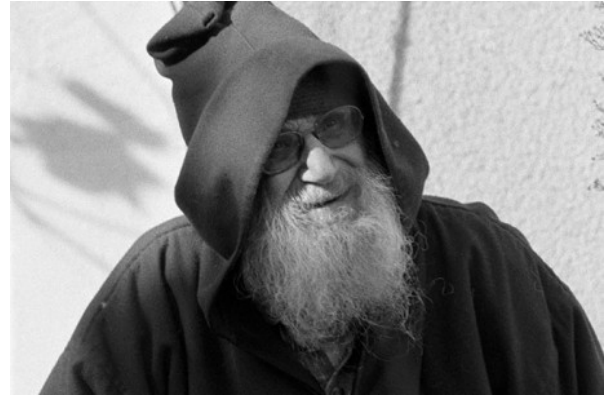
Key words: combinatorics on words, ℓ -abelian equivalence, regularity, recurrence, abelian return words, Sturmian words, graph theory, identifying codes, vertex-transitive graphs, generalized quadrangles, (r, a, b) -covering codes, infinite grid.

4 Alexander Grothendieck 1928–2014

On November 13, 2014 Alexander Grothendieck passed away in a hospital of the Southwestern town of Saint-Girons (France), near the village of Lasserre, where he had been living in isolation for decades. Grothendieck was born in Berlin on March 28, 1928 and is considered as one of the most influential Mathematicians of the 20th century.



Grothendieck lecturing at IHÉS in the 1960s.



More recent picture of Grothendieck.

His influence on Mathematics in Belgium was also considerable. His work in Algebraic Geometry has influenced many of our Mathematicians and he has been the supervisor of *Pierre Deligne* who received a Fields Medal in 1978 and won several other prestigious prizes.

A very good article about the life and Mathematics of Grothendieck appeared in the Notices of the American Mathematical Society in 2004. It is authored by Allyn Jackson and appeared in two parts which can be downloaded from the website of the AMS: [part1](#), [part2](#).

A documentary movie *Alexander Grothendieck, on the genius paths* appeared recently. Information can be found on <http://grothendieckfilm.tumblr.com/>.

The website <http://www.grothendieckcircle.org/> used to contain many Mathematical (and other) texts by Grothendieck. However, in January 2010 Grothendieck demanded to remove all of his writings. This was done but the website remains a huge source of information about this great Mathematician.

5 Why not become a member?

If you like what we do and want to support us, you should consider becoming a member of the BMS. The membership fee is only 20€ per year. Becoming a member is easy: just fill out the application form at <http://bms.ulb.ac.be/membership/appliform.php> and pay your dues. You can either pay via bank transfer (BIC: GEBABEBB / IBAN: BE70 0011 7447 8525) or via PayPal.

If you pay now you are a member for the year 2015.

As a member,

- 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. If you prefer not to receive the Bulletin of the BMS–Simon Stevin on paper, you can get it electronically. See section [7](#) for details.

- you will benefit from reciprocity agreements with the AMS, EMS, DMV, LMS, RSME, SMF, SBP-Mef, VVWL and KWG. This means you get a reduced membership fee for these societies. In case you are already member of one of these societies, your membership fee for the BMS is reduced to 18€. Details can be found on <http://bms.ulb.ac.be/membership/reciproc.php>
- you give our Society the possibility to develop actions: organizing meetings, promoting Mathematics and lobbying with the authorities.

One realization of our Society: the **BMS** has conceived and promoted the online access to **Zentralblatt** in the Belgian universities.

6 The website of the BMS

Our Society has a website (<http://bms.ulb.ac.be>) which looks a bit old fashioned but nevertheless provides useful information. There are 6 tabs:

Home. Contains general information about our Society and some documents and links.

Conferences. This part of the website contains a list of future [conferences](#) in Belgium. Would you like your conference to appear in this list? Mail the webmaster!

Newsletter. Here you can find all (but two) [BMS-NCM Newsletters](#) since the year 2000.

Bulletin. Contains all information about our [journal](#), the *Bulletin of the Belgian Mathematical Society – Simon Stevin*.

Jobs. Each time we get job announcements, we post them here. Again, this part of the website should be fed by members and departments!

Database. Have you already paid your dues for this year? Do you need the e-mail address of a colleague who is a member of the BMS? Our [online database](#) can provide the answer!

Try typing your family name in the search box. If you agreed to have your institution and e-mail in our public database at the time you became a member, you will see your institution and e-mail address. You will also see the year in which you last paid your dues. *If you forgot to pay for more than one year, you will get no response as you are not a member anymore!*

For privacy reasons this feature of the website is not documented on the website itself but only mentioned from time to time in the newsletter which is sent to our members.

Suggestions or help to improve the homepage are always welcome. Contact the [webmaster!](#)

7 Electronic version of the Bulletin

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>).

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

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

Figuring it out – Entertaining encounters with everyday math, 2010, Springer, ISBN 978-3-642-04832-6, 27.95 € (hbk), 227 pp. by *Nuno Crato*.



Nuno Crato

Nuno Crato, a former president of the Portuguese Mathematical Society (2004-2010), is a mathematics university professor in Lisbon. He is well known also among Portuguese non-mathematicians as a science writer and he featured regularly on Portuguese radio and television. In 2011 he became the minister of education. Portugal plays a leading role in the European Math-

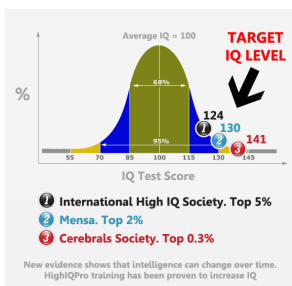
ematical Societies when it comes to popularization of mathematics. As an example, you might be interested in watching the six *YouTube* videos that were shown on Portuguese television in a series called *isto é matemática*¹

In this book Crato has collected 56 mathematical short ‘stories’, two to five pages long, and organized in six chapters. Each story points to some mathematical aspect of everyday life or relates some mathematical tidbit that everybody can be amused with or fascinated by. The nice thing being that the math itself is not really included. These stories should counter the man in the street’s ignorance about mathematics and mathematicians. The point he wants to make is, as we all know, that mathematics is everywhere and that without mathematics, we would still live in a prehistoric society.

I have seen many books on popularization of mathematics or that connect mathematics to all kinds of art forms, but this book is definitely different. Of course there are some obvious subjects that one will also find at other places, but there are also some items that were also new to me. Let me go through the chapters and mention some of the subjects.



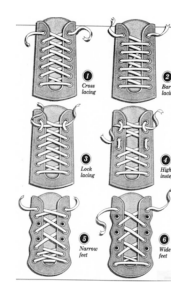
the other lane is faster



IQ increases



necktie knots

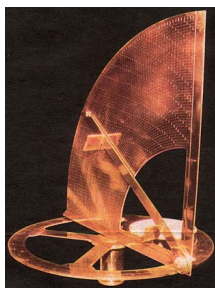


shoe lacing

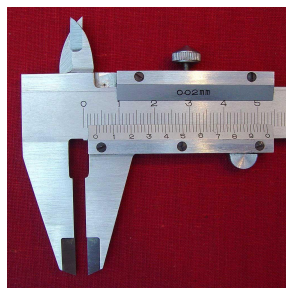
1. *Everyday mathematics*. This starts with logic SAT problems. E.g., whom to invite to a party, given certain compatibility conditions or other logical constraints. This entails the notions of NP problems. Game theory is illustrated with a cake cutting problem. The cover of the book shows how oranges can be piled up in an efficient way (sphere packing). That this way is optimal was first considered by Thomas Harriot (1560-1621) who discussed it with Johannes Kepler (1571-1630), and it was the subject of one of the first proofs by computer given by Thomas C. Hales in 1998. The result was published in the *Annals of Mathematics* although the computational aspects were not considered to be part of the mathematical proof. Some other topics are · the design of a just voting system · how the average IQ increases over the years · knots in neckties and lacing of shoes · sudokus, and · why it does not pay to keep changing lanes in a traffic jam, even though the other lane seems to be always the faster one.

2. *The earth is round*. Here we find · GPS and satellites · gear wheels in (mechanical) clocks · the shortest path for a plane to fly from Europe to the USA · the nonius scale and Vernier’s

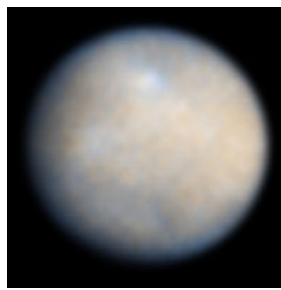
¹www.youtube.com/user/istoematematica



original nonius



nonius Vernier scale



Ceres

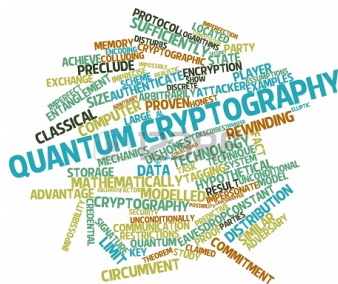
Description	Characteristic	Chart Abbreviation
Alternating		Alt. R.W.G.
Fixed		F.
Flashing		Fl.
Group flashing		Gp Fl.(2)
Occulting		Occ.
Group occulting		Gp Occ(3)
Quick flashing		Qk.Fl.
Very quick flashing		V.Qk.Fl.
Isophase		Iso.
Morse		Mo.(letter)

flash patterns

modification · the light characteristics of a lighthouse (these describe the type of flashes it emits, which will allow to identify it). Ceres, a dwarf planet, was discovered by Giuseppe Piazzi (1747-1826), but it seemed to have disappeared and could not be found again, until Carl Friedrich Gauss (1777-1855) at the age of 24 predicted the position. He used his method of least squares to calculate the orbit, and on the basis of these calculations Ceres was rediscovered by Franz von Zach (1754-1832) at only a half degree of angular distance from where Gauss had predicted it.



l.t.r. S, R, and A



quantum cryptography



Enigma machine

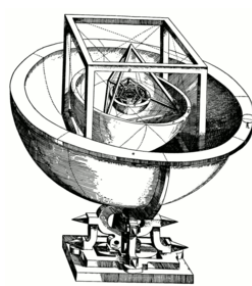


fingerprint

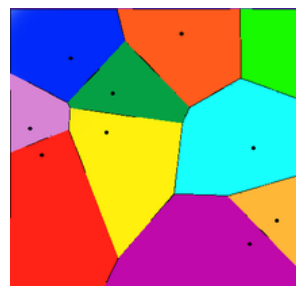
3. *Secret affairs.* Public key encryption is an obvious choice to fit in here, and also the RSA algorithm of Rivest, Shamir and Adler used to encrypt for example your credit card number when you send it over the Internet. When computers become fast enough to crack the RSA code, new methods like quantum cryptography has to be designed. Two other topics are the German Enigma machine used during WWII to encrypt military messages and the wavelet techniques used by the FBI to compress their database of fingerprints.



Fobonacci spiral



Platonic solids



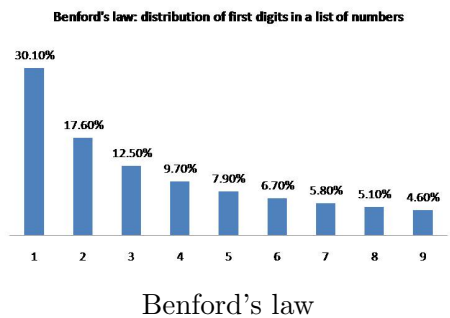
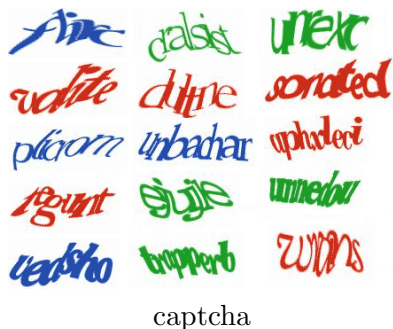
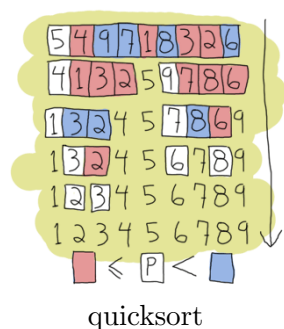
Voronoi diagram



Jackson Pollock

4. *Mathematics and art.* The items in this section are a bit more predictable. The Vitruvian man is an occasion to discuss pentagrams. Furthermore · Fibonacci numbers, the golden ratio, and paper sizes · the Platonic solids · the Möbius strip and the art of M.C. Escher · the fractal nature of the paintings of Jackson Pollock (1912-1956). Picasso in *Les demoiselles d'Avignon* tried to represent a three dimensional object in a four dimensional space by depicting different viewpoints in the same painting on a two dimensional canvas. Around the same time Henri Poincaré in his *Science et hypothèse* explains how a four dimensional world can be represented in a two-dimensional picture. The placement of observation towers in a forest used by park rangers to detect fires are illustrations of Voronoi diagrams, i.e., an optimal division of the plane depending on a given set

of points. Other topics are frequencies in music but also in the mating process of mosquitos. And finally... the most beautiful of all: $e^{i\pi} = -1$.



5. *Mathematical objects.* The coherence here is a bit obscure to me, but the topic could be philosophical and sociological aspects of mathematics. It starts with some discussion of why nature seems to be following the rules of mathematics, or is it the other way around? The difference are explained between Platonism (according to which mathematics exists independent of our existence, waiting for us to be discovered) and formalism (considering mathematics as an axiomatic and logical construction, a 'game' of no significance). Variations of the quicksort algorithm leads to stochastic methods like Monte Carlo and Las Vegas type of algorithms, but also to some thoughts about what it really means to be random. What a conjecture is, is illustrated by the Collatz conjecture (which goes with many other names as well). A sequence is constructed as follows. Take an integer n , if it is even, divide it by 2, and otherwise compute $2n + 3$. The conjecture states that the sequence will always end with the number 1. It has been proved to be algorithmically undecidable in 2007. Benford's law says that the a digit $k \in \{1, \dots, 9\}$ being the first significant digit in a number increases if k is smaller. This has been used to detect tax fraud or falsified budgets of countries. The analysis of (financial) time series revealed the so-called *Noah effect* (the typical abrupt discontinuous changes) and the *Joseph effect* (the long term persistence of trends), biblically inspired terms coined by Mandelbrot. The Turing test which is conceived to distinguish a man from a machine, and hence to define intelligence, is reflected in the *captcha's* (Completely Automated Public Turing test to tell Computers and Humans Apart) that we have to read and type on websites to identify ourselves as humans. There is also a note on DNA computers and on π -day.

6. *Out of this world.* This collects some paradoxes. Among others, we find items discussing different voting systems (one man, one vote vs. others) that may not always result in the democratic objective that is strived for. The equality $0.999\dots = 1$ and calculus with ∞ may give unexpected results for the layman. Furthermore there is Bertrand's paradox (after Joseph Bertrand) and the paradox of William Newcomb. In the latter there are 2 boxes, a transparent and a black one. Predictor P puts 1.000 € in the transparent box, and puts either nothing or 1.000.000 € in the black box. Then he calls in B and tells him to freely choose either the black box or both boxes and keep the contents, but he warns B that he can perfectly predict B's choice and foretells that if B chooses both boxes he will get just the 1.000 €, while if B chooses the black box, he will get the 1.000.000 €. Depending on B's reasoning, either choice can be optimal for him. If P predicted he would choose the black box, it is better to choose both and vice versa.

This collection is really a joy to read. The items are short and can be consumed in a short couple of minutes and so reading can be interrupted if needed. This is the literature that should be in the waiting rooms all over the country instead of the glossies and tabloids. People spend there some short time and can be called in at any moment. An excellent moment to read one of the stories. Lacking a cup of tea or coffee, this is a worthy alternative.

Adhemar Bultheel

De pracht van priemgetallen. Het verhaal van een eeuwenlange zoektocht naar verborgen patronen, 2013, Prometheus, ISBN 978-90-351-3863-6 (pbk), 198 pp. by *Paul Levrie en Rudi Penne*



Rudi Penne & Paul Levrie

This book is only available in Dutch. Unfortunately, since the enthusiasm of the authors about prime numbers and mathematics in general is very inspiring. The authors form the male analog of the Dutch phenomenon of the *wiskundemeisjes* (Ionica Smeets & Jeanine Daems) who blogged their weekly column for *De Volkskrant* since 2006 on exciting mathematical topics. Unfortunately the blog was ended in 2010 and they can be followed via *Twitter*,

but the archive is still available¹ although there seem to be some problems with *WordPress* since begin 2013. They also published a book *Ik was altijd heel slecht in wiskunde* in October 2013 which is a collection of their best columns. Penne and Levrie also have a math-blog *Wiskunde is Sexy*² they write for *Eos* since 2008 on a less regular basis. The book under review is not a collection of their blogs, but the collaboration for the blog has certainly been a source of inspiration for the book, which concentrates on prime numbers.

The authors address the readers as mathematical laymen, but nevertheless, they use formulas and theorems, but immediately putting the reader at ease, and putting mathematics and mathematicians in perspective. Juggling with numbers and number puzzles may seem a nerdy passtime, and yet at the same time, screening the most important mathematicians of all times and their relation with prime numbers shows that prime numbers are important building blocks of all numbers and, in a certain sense, also of a large part of mathematics in general.

In 47 (a prime number of course) short chapters, a great many names (the name index lists 87 names) are characters in the stage play of which the scenario is written by the prime numbers. From Aristotle to Harald Helfgott (who proved the weak Goldbach conjecture in May 2013), they all play a role. The first part of the book is mainly historical, but there are many excursions that you would not immediately connect with prime numbers. The space message launched since 1974 consisting of $1679 = 73 \times 23$ bits, towers of Hanoi, measuring the length of the equator, the concept of infinity (including a proof of Ramanujan's remarkable formula $1+2+3+\dots = -1/12$), and modulo calculus (with related card tricks).

Of course also the *Great Problems of Mathematics* make their appearance: The Goldbach conjecture, Bertrand's postulate, the Green-Tao theorem, Gilbreath's conjecture, and of course the Riemann hypothesis. The nerdiest is their chapter 37 (another prime) called *Priempret* (Prime pleasure). One can imagine magic squares consisting of only prime numbers, or palindromic primes (palprimes), emirps (a non palindromic prime when written in reverse is again prime), sexy primes (a couple of primes that differ by 6), palinpoints (n is a palinpoint when it solves the equation $P(R(n)) = R(P(n))$ where $P(n)$ denotes the n th prime number and $R(m)$ reverses the order of the digits of number m), vampire numbers (I will let you look that up in *Wikipedia* yourself). How much of a geek can you be?

The best known applications of prime numbers is the composition of the IBAN bank account number and RSA public key cryptography. However, not only humans have created applications of primes. They also show up as the 17-year life cycle of certain cicadas, the construction of n -gons with ruler and compass is only possible when n is prime, etc.

Warning: this book may spread an infectious and very itchy prime virus among their readers.

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¹www.wiskundemeisjes.nl

²weetlogs.scilogs.be/index.php?blogId=11