BELGIAN MATHEMATICAL SOCIETY

Comité National de Mathématique CNM

C W N M

NCW Nationaal Comite voor Wiskunde

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

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BMS-NCM NEWS

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No 97, March 15, 2014

Letter from the editor

Welcome to this sunny edition of our Newsletter

Have a nice spring time!!

Regards, Françoise

Contents

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 will take place in Seoul, Korea.***

On Wednesday November 12, 2014, at the Academy,

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

Please note that the ***General Assembly of the BMS*** will also take place on November 12, 2014.

1.2 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 March 2014

UMons – Journée EDT
Wednesday, March 19, 2014

See the announcement at the end of the Newsletter

2.2 June 2014

FNRS group "Functional Analysis"
Thursday-Friday, June 12-13, 2014 — Esneux (Liège) , Domaine du Rond-Chêne

Following the tradition, the FNRS group "Functional Analysis" will meet next June (June 12-13, 2014). The meeting will take place in the small town of Esneux, in the "Domaine du Rond-Chêne".

The speakers are listed here below (alphabetical order)

- J. BONET (U. Pol. valencia)
- Q. MENET (U. Mons)
- J. MULLER (U. Trier)
- A. PRZESTACKI (Poznan)
- M. QUEFFELEC (U. Lille)
- J.M. RIBERA (U. Pol. Valencia)

For more information:
contact Françoise Bastin (F.Bastin@ulg.ac.be) or Catherine Finet (catherine.finet@umons.ac.be)

3 From the EMS

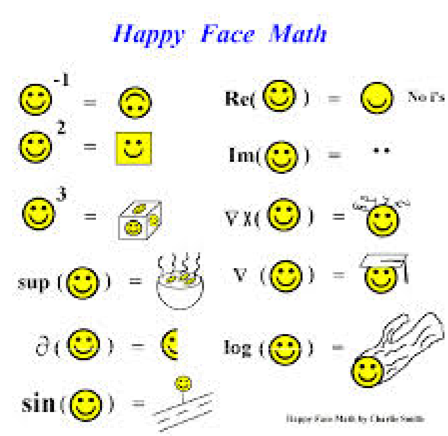
3.1 Newsletter

The March issue of the Newsletter is on line:

http://www.ems-ph.org/journals/journal.php?jrn=news

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

As usual, please find here some reviews from A. Bultheel ... and also something on this special $\pi-$day, from P. Levries

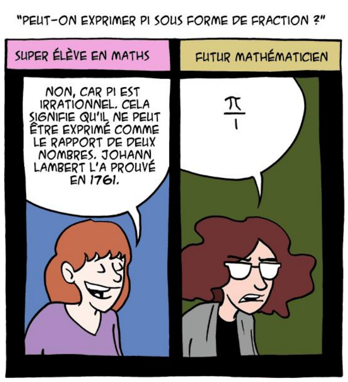


pi-trivia

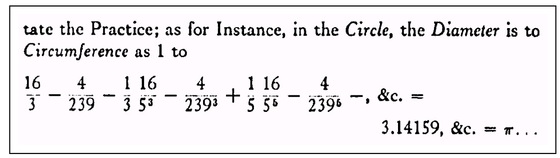
Did you know that . . .

- . . . today is π-day?
  Why? Because in America they write 3/14 for the date of today March 14, and 3.14 is an approximation to the number π.
- . . . this year there's exceptionally a full π-month: 3/14 ?
- . . . the number π (still) is the ratio between the circumference of a circle and its diameter?
- . . . the first 500 decimal digits of the number π are:

  3.141592653589793238462643383279502
  88419716939937510582097494459230781
  64062862089986280348253421170679821
  48086513282306647093844609550582231
  72535940812848111745028410270193852
  11055596446229489549303819644288109
  75665933446128475648233786783165271
  20190914564856692346034861045432664
  82133936072602491412737245870066063
  15588174881520920962829254091715364
  36789259036001133053054882046652138
  41469519415116094330572703657595919
  53092186117381932611793105118548074
  46237996274956735188575272489122793
  818301194913
- . . . the 10 000 000 000 000-th decimal digit of π is 5?
- . . . that π is an infinitely long, non-repeating decimal number? Hence you cannot write the number π as a fraction with a whole number as numerator and as denominator.



- . . . it is not useful to learn all these decimal digits by heart? Knowledge of a few digits is for most applications sufficient. With 39 digits you can calculate the circumference of the universe with accuracy the size of a hydrogen atom.
- . . . you can get your name into the Guinness Book of Records by learning enough digits by heart? Chao Lu (China) holds the current record for memorising π. He was able to recite π from memory to 67,890 places. The event took place at the Northwest A&F University, Shaanxi province, China, on 20 November 2005, and it lasted 24 hours and 4 minutes.
- . . . the notation π was probably used for the first time in the book Synopsis Palmariorum Mathesos (1706) (translation: a new introduction to mathematics) by a certain William Jones (1675-1749)?

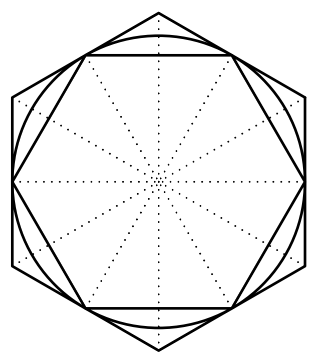


tate the Practice; as for Instance, in the *Circle*, the *Diameter* is to *Circumference* as 1 to

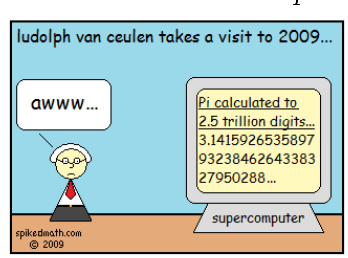
$$\frac{16}{3} - \frac{4}{239} - \frac{1}{3}\frac{16}{5^3} - \frac{4}{239^3} + \frac{1}{5}\frac{16}{5^5} - \frac{4}{239^5} -, \text{\&c.} =$$

3.14159, &c. = π. . .

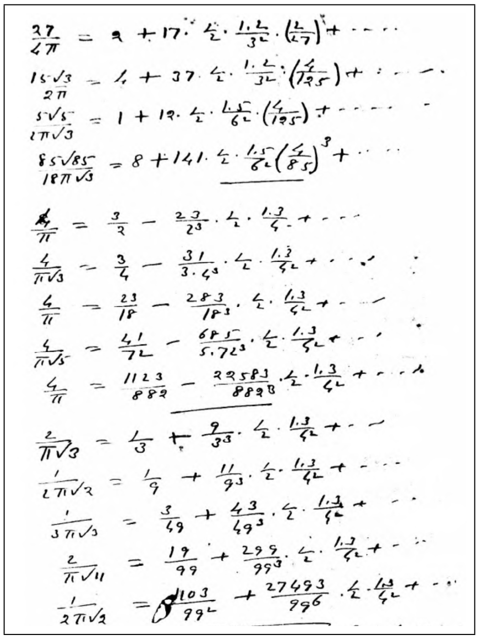
  The great mathematician Leonhard Euler (1707-1783) was responsible for the popularization of the notation.
- . . . Archimedes already calculated approximations to π around 250 BC? He did this by constructing regular polygons (with an increasing number of sides) inscribed and circumscribed to a circle of radius one, and calculating half the circumference of these polygons.



  These values give lower an upper bounds for the value of π. This is why the number π is sometimes called *Archimedes' constant*.
- . . . Ludolph Van Ceulen (1540-1610), a German mathematician, spent the bigger part of his life calculating digits of the number π by hand. Using Archimedes' method he was able to compute the first 35 decimals. This is why π is sometimes called the *Ludolphian number*.



- ... the Indian mathematician Srinivasa Ramanujan (1887-1920) probably had a special bond with the number π? He left some notebooks that were filled with mathematical formulas. The number π is on almost every page at least one time. Here you see one of the pages:



- ... recently a new series was found for which the sum contains the number π? The Catalan numbers C_n, named after the Belgian mathematician Eugène Catalan (1814-1894), show up in all sorts of counting problems and are defined as follows:

$$C_n = \frac{1}{n+1}\binom{2n}{n}$$

Koshi and Gao proved in 2012 that

$$\sum_{n=0}^{\infty} \frac{1}{C_n} = 2 + \frac{4\sqrt{3}}{27}\pi$$

- ... you can calculate the number π with great precision with a formula containing only threes? The formula

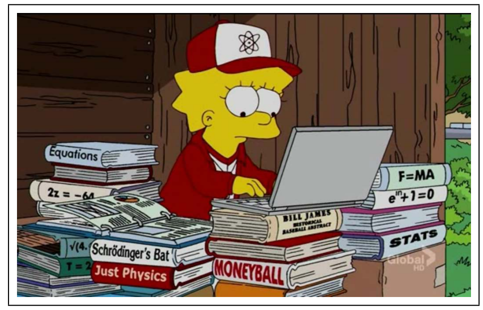
$$3 + \sin 3 + \sin(3 + \sin 3) + \sin(3 + \sin 3 + \sin(3 + \sin 3))$$

gives you the first 32 decimal places of the number π.

- ... the most beautiful formula in mathematics (of course) contains the number π?

$$\mathrm{e}^{\mathrm{i}\cdot\pi} + 1 = 0$$

The number e in this formula is Euler's constant, and i is the complex unit, which satisfies $i^2 = -1$.
And that this formula appears in one of the episodes of The Simpsons?

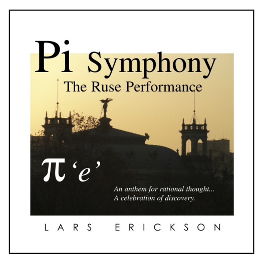


- ... there are formulas that provide a link between the prime numbers and the number π? For instance these two:

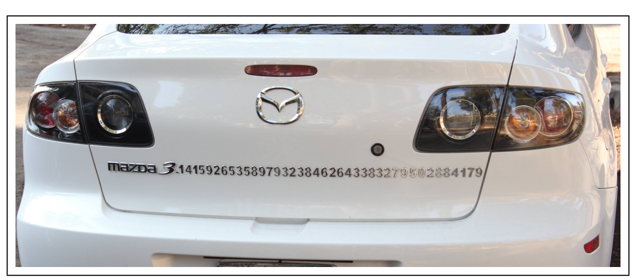
$$\frac{\pi^2}{6} = \frac{2^2}{2^2-1}\cdot\frac{3^2}{3^2-1}\cdot\frac{5^2}{5^2-1}\cdot\frac{7^2}{7^2-1}\cdot\frac{11^2}{11^2-1}\cdots$$

$$\frac{\pi}{4} = \frac{3}{4}\cdot\frac{5}{4}\cdot\frac{7}{8}\cdot\frac{11}{12}\cdot\frac{13}{12}\cdot\frac{17}{16}\cdot\frac{19}{20}\cdot\frac{23}{24}\cdot\frac{29}{28}\cdots$$

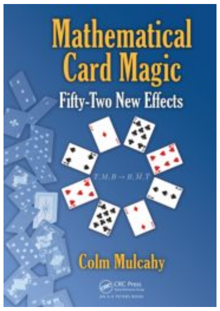
- ... the number π gives you a convenient way to remember the number of seconds in a century? The number π is indeed a good approximation of the number of seconds in a nanocentury. The number of seconds in a century is approximately equal to $\pi \cdot 10^9$. This is called Duff's rule (thank you, Ronald).
- ... Lars Erickson has composed a π-symphony?



- ... the number π shows up in the strangest places? For example here: pick any two integers. What is the probability that these numbers have no common factor? That probability is $6/\pi^2$.
Or here (thank you, Adhemar):



Mathematical Card Magic: Fifty-Two New Effects, 2013, A K Peters/CRC Press, ISBN 978-14-6650-976-4 (hbk), xxv+354 pp. by *Colm Mulcahy*.



Colm Mulcahy

Colm Mulcahy has Irish roots, with a MSc from the University College Dublin, but he got a PhD from Cornell, and he is teaching at the Math Department of Spelman College, Atlanta (GA) since 1988. He regularly contributes a math column to The Huffington Post, but he is foremost an enthusiastic user of internet media. He has a *Math Colm*[1] blog, and on his *Card Colm*[2] website he has many interesting links, for example to material related to his much admired hero Martin Gardner, but most of all to the items of his bimonthly *Card Colm blog*[3], that is sponsored by the MAA. In the latter he discusses mathematically based 'effect' (he avoids using the word 'tricks' for some reason) you may obtain by manipulating a card deck. His website has extra videos illustrating the manipulation of the cards, and of course a link to the book under review. This book is the eventual realization of a suggestion made to him by Martin Gardner, many years ago.

So here it is: a book presenting 52 effects arranged in 13 chapters, with 4 sections each, a numerological predestination for a book about card tricks. The actual contents is however a bit liberal with these numbers. There is for example an unnumbered introduction that serves as an appetizer but also introduces some terminology and card shuffling techniques, and there is a coda that gives some additional information. Also each chapter may have the four 'effects', but they often consist of several introductory sections as well. The effects get some inspiring names like *Full House Blues*, *Easy as Pi*, or *Twisting the Knight Away* etc. The effects are usually introduced in several steps: *How it looks* is just describing what an uninformed observer will experience, then *How it works* says what the mathemagician is actually doing, and in *Why it works* it is explained in more detail what is going on. This is often followed with different options on how to present the magic to the public. Also the origin of the method is referred to, which, no wonder, is often one of his Card Colms blogs. The chapters end with some *Parting Thoughts* which are further elaborations of the previously introduced principles, sometimes in the form of exercises: 'prove that...', 'what if...', 'how to...'.

Mulcahy also gives his effects some Michelin-like ratings in the margins. It can have one ♣ (easy) up to four ♣♣♣♣ (difficult) clubs for mathematical sophistication, similarly hearts ♥ grade entertaining value, spades ♠ are used to rate the preparatory work needed, and diamonds ♦ refers to the concentration and counting that is needed during the performance.

The effects are based on underlying mathematical principles. There are many of them, and most are believed to be original in their application to card magic. Since these principles are introduced but also re-used at several instances, they get some mnemotechnic names. Some recurrent ones are the COAT (Count Out And Transfer) and TACO which is some kind of inverse, not to be confused with a CATO (Cut And Turn Over). These give rise to neologisms like 'minimal underCOATing' of 'Fibbing' when it concerns Fibonacci numbers. TOFUH stands for Turn Over And Flip Under Half, sounds healthier than the alternative FAT (Flip And Transfer). In many cases, the order of the suits is important. So the deck can be in cyclic CHaSeD (Clubs, Hearts, Spades, Diamonds) order, and there are many more like this. These witty namings and word plays make the text fun to read.

Since Mulcahy stresses at many places that the mathemagician should not reveal the mathematics behind the magic, I will not uncover them either except for a simple example of the kind

[1] `aperiodical.com/category/columns/maths-colm/`

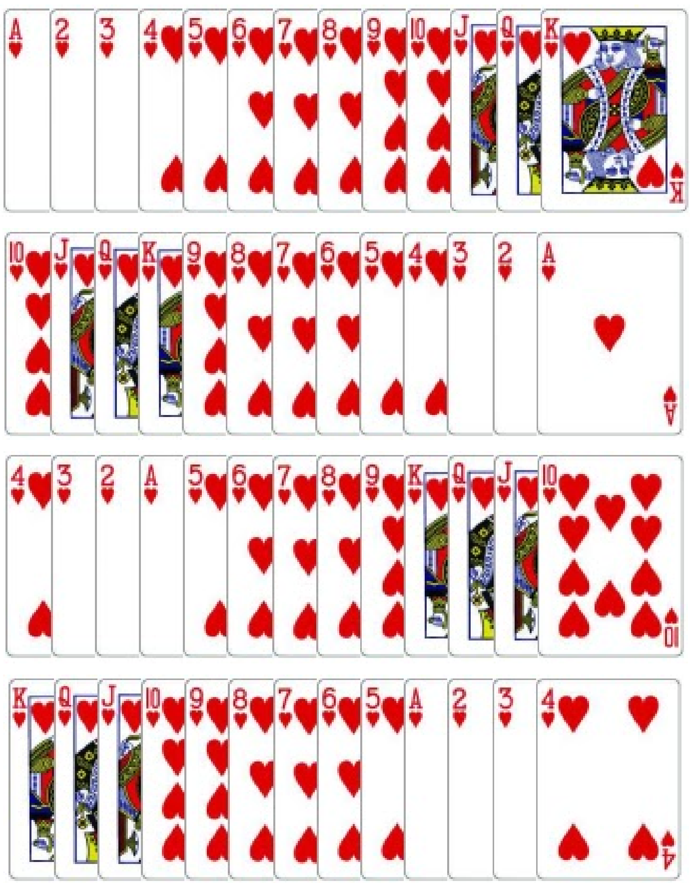
[2] `cardcolm.org/`

[3] `cardcolm-maa.blogspot.be`

of mathematics involved at the end of this review. As he writes: The best answer to the question 'How did you do that?' is to say 'Reasonably well, I think'. Unless the audience is really interested in the mathematics, it is unwise to explain what is going on. Otherwise comments like 'So is this all you did? It is just mathematics?', will kill all the magic. It is absolutely rewarding however to convince young people that mathematics is everywhere and can be fun to play with. So it is perfectly all right if a teacher explains the mathematics to his pupils.

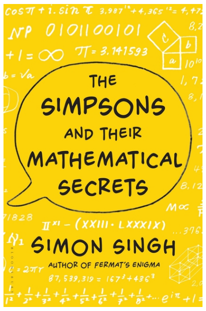
In most cases, the mathematics are not that advanced. Just counting will do. Not plain combinatorics or modulo calculus though (a terminology not used by Mulcahy). The fact that there are 13 different faces and 4 different suits makes the counting special. Fibonacci numbers can play a role, for example when the sum of two sequential cards in a deck forms a Fibonacci sequence, then the mathemagician can name the cards if the sum is called out. Occasionally some probability is in involved. As one reads along, the effects become more involved, hence more complicated to perform, but they will have a higher magical alloy and thus be more rewarding. Some involve an accomplice to assist the magician.

One word about the typography. The numbering of the chapters is with cards (A for the first, 2 for the second,..., K for the 13th) and the effects within the chapters are numbered like 6♣ for the first one in chapter 6, or K♠ for the third one in chapter 13 (CHaSeD order). Printed on glossy paper with many colour illustrations, it is not only fun, but also a pleasure to read. The apprentice magician will have a lot to practice on but even the professional magician will find many things to think about while mastering this wonderful calculus of the card deck.



Here is an illustration of what such an effect may look like. In his Card Colm of April 30, 2013, (and in chapter A♥ of the book) Mulcahy explains the 'Low-Down Triple and Quadruple Dealing' effect. The magician deals k cards from the top (hence reverting order). If there are n cards in the deck, then k has to satisfy $n/2 < k \leq n$. Then he drop the rest of the deck on top of them. This is just a simple COAT. The effect is obtained by triple COATing, i.e., repeat the COAT two more times. The result will be inevitably that the card originally at the bottom will end up at the top as seen in the illustration. An example. Take $n = 13$ cards, which for illustrative reasons are ordered as A♥,...,K♥, and we are looking at them face-up, which is not what the spectators see. They are looking at a face-down deck. The pictures show the initial stage with the K♥ at the bottom and A♥ on top. After a 'Low-Down Triple Dealing' with $k = 9$, K♥ will be at the top of the deck. What will happen after one more COAT?. What happens when $k = 5$ (underCOAT) or $k = 10$ (overCOAT), i.e., when it does not satisfy the preset bounds. Of course the magical effect will only work if this is not known to the public and if a proper show-element is added, by letting the spectators shuffle the cards, peek at the bottom card, and letting them choose for example their favorite ice cream flavor and dealing the k cards by counting the letters in the word 'chocolate' if that happened to be their choice. Adhemar Bultheel

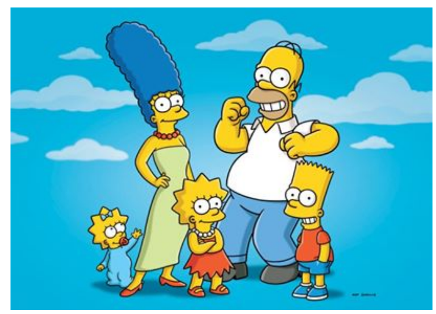
The Simpsons and Their Mathematical Secrets, 2013, Bloomsbury USA, ISBN 978-162040277-1, 26 USD (hbk), 272 pp. by *Simon Singh*.



Simon Singh

I was never a big fan of the Simpsons. I guess it will depend on when you or when your children were young whether you are a Treky, or a super fan of Monty Python, a Doctor Who addict, or a groupy of the muppets. Anyway, after reading the book by Simon Singh, I realize I may have missed something.

I knew Sing as the author of *The Code Book* (1999), a popular book about cryptography, his *Fermat's Last Theorem* (1997) and more recently *Big Bang* (2004) and *Trick or Treatment?: Alternative Medicine on Trial* (2008). At the age of 40 he has compiled a respectable CV. With a PhD in particle physics, he is science collaborator at the BBC, received an MBE and has several doctor honoris causa degrees. Enough to trigger interest if a new book comes out.



For this book, Singh analyses the mathematical puns that the authors of the Simpsons have put into several of the episodes of this sitcom. As a matter of fact, it turns out that the script writers have university degrees in mathematics and physics and are admirers of Martin Gardner's recreational mathematics. Five of the 'nerdiest writers' (as Singh calls them) are J. Stewart Burns (MS Mathematics, UC Berkeley), David S. Cohen (MS Computer Science, UC Berkeley), Al Jean (BS Mathematics, Harvard), Ken Keeler (PhD Applied Mathematics, Harvard), Jeff Westbrook (PhD Computer Science, Princeton). Singh actually met some of the writers and got some of the inside information. However, a lot of the math stuff can also be found on the web pages[1] compiled by Sarah J. Greenwald and Andrew Nestler, two enthusiastic math teachers who use these elements in their classes.

The Simpsons is a series created by Matt Groening in 1989. It started its 25th season in September 2013. It tells the human condition of a middle class family consisting of Homer and Marge and their children Bart, Lisa and Maggie. Already in the first regular show called 'Bart the Genius', we see Maggie towering alphabet blocks forming the sequence EMCSQU (obviously referring to $E = mc^2$).

Al Jean & Matt Groening

During the first two seasons, Mike Reiss (another mathematically gifted student although he eventually chose for a major in English though) and Al Jean were the ones dropping the mathematical jokes. When they later became the executive producers, they could hire other writers with good math credentials. Often the jokes were based on English homophones, like when you read πr^2, then it sounds like 'pie are square' while a pie is round, but crackers are square.

Singh interlaces his chapters with some vignettes on mathematical humor which he organizes as a quiz. One may score a maximum of 20 points on each. One example goes as follows: Q: Why did 5 eat 6? A: Because 7 8 9, another of these word plays.

[1] `mathsci2.appstate.edu/~sjg/simpsonsmath/` and `homepage.smc.edu/nestler_andrew/SimpsonsMath.htm`

there was not a mathematical reference in the episode. So Westbrook smuggled in three seemingly random numbers that appeared on the Simpson's television screen. It was a multiple choice quiz where one had to guess the number of attendees of the game. The numbers are 8191, 8128, and 8208. The first turns out to be the 13th Mersenne prime $8191 = 2^{13} - 1$. The second number is the 4th perfect number (equals the sum of its divisors). The third number is a narcissistic number (it equals the sum of the powers of its digits where the power is equal to the number of its digits, i.e. $8208 = 8^4 + 2^4 + 0^4 + 8^4$).

Singh takes the opportunity at different occasions to elaborate on some of the mathematical subjects, some anecdotes, and some history. So he describes elements form game theory, the concept of infinity, sorting algorithms, $P = NP$, $e^{i\pi} = -1$, higher dimensional geometry, etc.

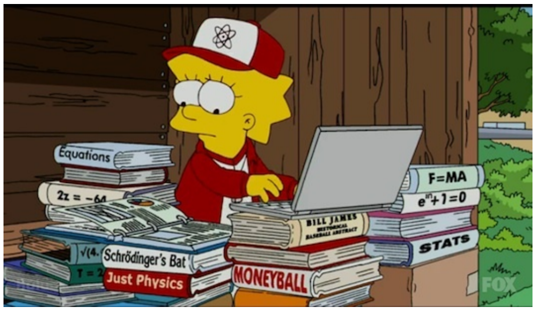
The book also has three chapters on *Futurama*. This is another product from Groenings brain. The idea started in 1996 and got a first broadcast in 1999. It is similar to the Simpsons, but the characters are different and it is science fiction-like so that practically every scenario is made possible. David Cohen who was a big fan of science fiction and in particular of the *Star Trek* series, was helping to shape the series. There are even more nerdy references in this series than in the Simpsons. However, they are more in the background, not standing in the way of the plot. Therefore the 'freeze-frame' technique is used to draw attention to some of them. An example: When Bender, a main character, is in a haunted castle, the digits 0101100101 are written in blood on the wall, but when he sees these in the mirror, he is terrified because 1010011010 is the binary representation of 666, the Number of the (Binary) Beast. Here is another one: $\mathrm{II}^{\mathrm{XI}} - (\mathrm{XXIII} \cdot \mathrm{LXXXIX})$. After translation from roman to arabic, it becomes $2^{11} - (28 \times 89)$ which is 1. Hence $2^{11} - 1 = 23 \times 89$ and $2^{11} - 1$ is the smallest number of the form $2^n - 1$ that is not prime. Also the number 1729 pops up several times in the series. This is special because the 1729th digit of e marks the place where all the ten digits occur consecutively: the sequence is 0719425863. You might also recognize it as the number of the taxi in which Hardy picked up Ramanujan with the famous anecdote that Hardy thought it a rather dull number whereupon Ramanujan promptly replied that it was the first number that could be written as the sum of two cubes in two different ways. Since then the number 1729 has become popular and many other funny properties were discovered: is a *harshad number* (a term coined by the Indian mathematician D.R. Kaprekar). In Futurama, a taxi cab has number 87539319 which is the smallest number that can be written in three different ways as a sum of two cubes.

Singh also elaborates on the so-called *Futurama* or *Keeler theorem*. At some point in the episode *'The Prisoner of Benda'*, a machine can switch the minds of persons, but can not do the same operation on the same persons twice. So things get mixed up and in the end seven minds were moved to bodies that were not their own. To close the episode with an happy ending, all minds should end up in their original bodies. However, a solution is not always possible, unless some extra characters are thrown in the switching process. Ken Keeler solved the problem and proved, that whatever the number or whatever the mixup, only two extra persons are needed to fix everything. Keeler never published the theorem formally, but it inspired a research paper in the *American Mathematical Monthly*.

A most entertaining book that will teach some mathematics for the lay readers and give a lot of fun for the mathematician. It makes you part of the fun that the writers obviously have in producing the shows.

Adhemar Bultheel

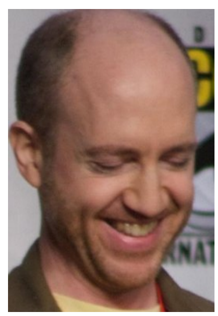
A math reference placed by David Cohen in *'Homer's last temptation'* was $3987^{12} + 4365^{12} = 4472^{12}$. This relation is obviously wrong as we all know, but if you try it out on your finite precision calculator, this is exactly what you get because of rounding errors. Homer also wrote the following formula on the blackboard $M(H^0) = \pi(\frac{1}{137})^8\sqrt{\frac{hc}{G}}$. This refers to the mass of the Higgs boson particle. It results in 775 GeV, an overestimate of the 125 GeV that was measured in CERN in 2012 and for which the Nobel Prize was awarded to Higgs and Englert in 2013.



The computer scientist Westbrook of the writers team, has an Erdős-Bacon number 6. We know what an Erdős number is, and a Bacon number is similar, but refers to Kevin Bacon, an American actor, and co-authoring is replaced by co-acting. Westbrook has Erdős number 3 and Bacon number 3, giving his Edős-Bacon number 6. It somehow tells how well he is connected both in mathematics and in Hollywood circles. Westbrook has the lowest number of that sort in the Simpson team. It is difficult to do better. Dave Bayer who was consultant for and played a minor role in the film *A beautiful mind* about John Nash, so got Bacon number 2, but he also co-authored a paper with Erdős which gives him a hardly beatable Bacon-Erdős number 3. Only Bacon himself could do better if he started a mathematics career and wrote a paper with someone who has Erdős number 1, which would result in a minimal Bacon-Erdős number 2. The chances for that to happen are not so high.

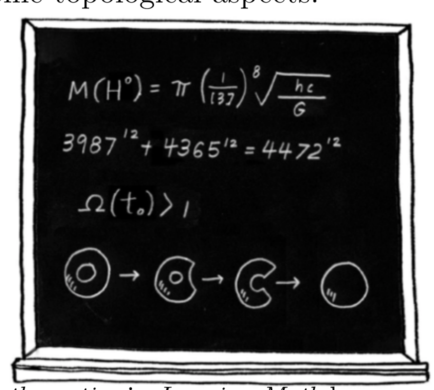

Mike Reiss


Jeff Westbrook


Ken Keeler


David S. Cohen

Lisa is particularly gifted for mathematics. In the episode *MoneyBart* her laptop rests on a book entitled *Bill James Historical Baseball Abstract*. That is an existing catalog of baseball statistics. This Bill James invented *sabermetrics*, an empirical analysis of the activity of a (baseball) player that is based upon statistics. Singh explains the technique and illustrates how Bart Simpson, by not following the rules of sabermetrics, worked out by Lisa, loses the game. In the episode *'They saved Lisa's brain'*, Stephen Hawking appears as a character. Hawking, great fan of the show especially flew over to the studio to speak a sentence via his voice synthesizer. His ideas about a doughnut shaped universe is worth another chapter where Singh is working out some topological aspects.



Lisa's love for mathematics is also an incentive for an episode of the Simpsons. Mathematics not being taught in the girls school, forces Lisa to dress up as a boy to attend these courses. Singh elaborates this further. It is still true that women are under represented among mathematicians, and he takes the sexist experiences of Sophie Germain as an example[2].

Of course prime numbers also play a role. At some moment, Greenwald and Nestler mentioned above visited the writers team to attend a working session. However, at the end of the day the writers realized

[2]See *Sophie's diaries* by Dora Musielak, MAA, and the chapters on *women in mathematics* in *Imagine Math* by M. Emmer, Springer (reviewed in this newsletter, issue 93, May 2013).

Faculté des Sciences

UMONS
Université de Mons

Catherine FINET –
Karl GROSSE-ERDMANN

JOURNEE ORGANISEE AVEC LE SOUTIEN DE L'EDT MATH

Services d'Analyse Mathématique et de Probabilités et Statistique

10h30 **Romuald Ernst (Université Blaise Pascal, Clermont-Ferrand)**
Le paradoxe de Banach-Tarski et l'axiome du choix

14h30 **Maxime Bailleul (Université d'Artois, Lens)**
Autour des séries de Dirichlet

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