Newsletter

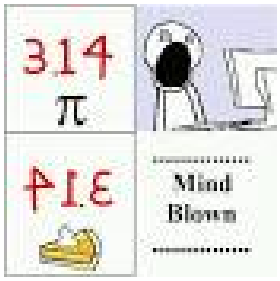
BELGIAN MATHEMATICAL SOCIETY

107, March 15, 2016

Comité National de Mathématique CNM

C W M
N

NCW Nationaal Comité voor Wiskunde



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

ULB Campus Plaine, C.P. 218/01,
Bld du Triomphe, B-1050 Brussels,
Belgium

Website: http://bms.ulb.ac.be
Newsletter: F.Bastin@ulg.ac.be
Tel. F. Bastin, ULg: (32)(4) 366 94 74

Contents

Some regularity in the irregularity of the sequence of prime numbers?

A lot has happened in the last few days while I was preparing this newsletter.

Yesterday was π-day! I hope all of you had fun and celebrated this day in one way or another. In section 6 of this Newsletter you'll find some fun facts about π. They were compiled by Paul Levrie. At the Vrije Universiteit Brussel we traditionally have a math competition for highschool classes on π-day. It is always very nice to see pupils who enjoy mathematics and it is surprising to see how creative some of them are.

This year Ingrid Daubechies was also in Brussels on π-day and we had the opportunity to discuss mathematics and compare Belgium to other countries. As always, we quickly reached the conclusion that Belgium must be the most complicated country in the world and that it was more relaxing to talk about mathematics only. Ingrid drew my attention to a very recent and unexpected observation on the sequence of prime numbers.

A few days ago a paper entitled "Unexpected biases in the distribution of consecutive primes" appeared on ArXiv. The authors, Robert J. Lemke Oliver and Kannan Soundararajan, from Stanford University, study the reduced residue classes (mod q) of pairs of consecutive prime numbers. One would expect that every pair of (admissible) reduced residue classes is equally likely to occur. For example, most of us believe(d) that a prime should have an equal chance of being followed by a prime ending in 1, 3, 7 or 9 (the four possible endings for all prime numbers except 2 and 5). Looking at prime numbers written in base 3 —in which roughly half the primes end in 1 and half end in 2— the authors found that among the first 400 billion primes, a prime ending in 1 is more than twice as likely to be followed by a prime ending in 2 than by another prime ending in 1. Likewise, a prime ending in 2 prefers to be followed a prime ending in 1. This is quite striking and the authors try to explain this phenomenon using the famous Hardy-Littlewood conjectures.

If you want to know more about this new prime number mystery, you can read the ArXiv paper or the more easy-reading article in Quanta Magazine.

Philippe Cara,
president of the BMS

1 Meetings, Conferences, Lectures

1.1 March 2016

BeNeLuxMC 2016 Amsterdam

March 22-23, 2016

The Koninklijk Wiskundig Genootschap, the Belgian Mathematical Society and the Luxembourg Mathematical Society will jointly organize the BeNeLuxMC 2016 at the Science Park in Amsterdam. This congress will incorporate the 52nd Nederlands Mathematisch Congres. The local organization is in the hands of a team of mathematicians from the University of Amsterdam, the Centrum Wiskunde en Informatica and the Vrije Universiteit.

See information on webpages https://www.wiskgenoot.nl/congressen/nmc

1.2 April 2016

mini-congrès Math en Jeans/Belgique

15 et 16 avril 2016 à Liège (ULg)

Le Département de mathématique de l'ULg est heureux de vous inviter au premier **mini-congrès Math en Jeans/Belgique** qui se déroulera les **15 et 16 avril 2016** au bâtiment B37 du campus du Sart Tilman à Liège. A cette occasion, plusieurs classes belges ayant participé cette année à l'initiative viendront présenter leurs travaux, de façon joviale et compréhensible. Il y aura également des présentations de vulgarisation par des orateurs expérimentés: Prof. Kouider Ben-Naoum de l'UCL (et organisateur de Dédra-MATH-isons) et Frédéric Beaumaikers de la Maison des Maths.

L'entrée est libre mais les places sont limitées; il est donc préférable de s'inscrire. Toutes les informations sont disponibles ici: http://www.math.ulg.ac.be/mej2016.html

---

Arithmétique en plat pays/Getaltheorie in het vlakke land

Monday April 18, 2016 at the Vrije Universiteit Brussel

Programme:

11:00–12:00	Samir Siksek (Coventry) : Sums of seven cubes
12:00–14:00	Lunch break
14:00–15:00	Karin Halupczok (Münster) : Goldbach's problem with primes taken from arithmetic progressions and short intervals
15:00–16:00	Jie Wu (Nancy) : Sign changes of Fourier coefficients of half-integral weight cusp forms
16:00–16:30	coffee break
16:30–17:30	Geertrui Van de Voorde (Gent) : Field reduction in finite projective geometry
19:00–	Dinner

The website http://www.mathconf.org/app-gvl-spring2016 contains practical information and a link for registration.

Looking forward to meeting you at this colloquium, —Philippe Cara and Jan De Beule

1.3 May 2016

Analysis and beyond

celebrating Jean Bourgain's work and impact

May 21–24, 2016, IAS Princeton, USA

Please note that the Institute for Advanced Studies organizes (at Princeton) a **meeting in honour of Jean Bourgain** next May: see https://www.math.ias.edu/bourgain16

Brauer groups, Hopf algebras and monoidal categories

A conference in honour of Stef Caenepeel on the occasion of his 60th birthday

May 24-27, 2016, Turin, Italy

In 2016, Stef Caenepeel (former president of the BMS) will turn 60. To celebrate this joyful event, a conference is organized in Turin, Italy, from Tue 24 - Fri 27 May 2016. Hereby, you are cordially invited to participate in this meeting.

The conference website can be found on the address:

http://homepages.vub.ac.be/ hopfalgb

If you are interested to attend the conference, please fill out the registration form that is available on this site. Feel free to forward this message to everyone who might be interested.

We hope to be welcoming you in Turin next May.

Best wishes, The organizers,
Ana Agore
Alessandro Ardizzoni
Sorin Dascalescu
Isar Goyvaers
Gigel Militaru
Joost Vercruysse

1.4 June 2016

Second joint Conference of the

Belgian, Royal Spanish and Luxembourg Mathematical Societies

June 6–8, 2016, Logroño, Spain

Second announcement

- WEBSITE : http://bsl.unirioja.es
- CONFERENCE SITE

  The conference will take place at convention centre Riojaforum and at Faculty of Science and Technology in Logroño, Spain
- REGISTRATION

  The registration is open now until May 31, 2016. The registration fee is 60 EUR. PhD students have a 40 EUR registration fee. More information on https://bsl.unirioja.es/registration.php

  Information on special arrangement for accommodation available on https://bsl.unirioja.es/hotels.php Special prices are guaranteed until April 25, 2016
- PROGRAMME

  Besides ten special sessions and posters sessions, there will be seven plenary talks. More information on the website.
- PLENARY SPEAKERS
  - *Sara Arias de Reyna*
    Faculté des Sciences, de la Technologie et de la Communication Université du Luxembourg.
  - *María Jesús Carro*
    Departamento de Matemática Aplicada y Análisis Facultad de Matemáticas Universidad de Barcelona. (Valdivia Lecture)
  - *Raf Cluckers*
    Université Lille 1 Sciences et Technologies Laboratoire Painlevé.
  - *Sergei Merkulov*
    Faculté des Sciences, de la Technologie et de la Communication Université du Luxembourg.
  - *Johannes Nicaise*
    Imperial College London Department of Mathematics.
  - *Jesús María Sanz Serna*
    Departamento de Matemáticas Universidad Carlos III
  - *Anton Thalmaier*
    Unité de Recherche en Mathématiques, FSTC Université du Luxembourg.

2 PhD theses

Lookback options with floating strike and binomial approximations

Fabien Heuwelyckx, University of Mons

Date and place of public defence: April 28, 2016, 16h30, Umons

Thesis advisor : K. Grosse-Erdmann (UMons)

Summary : Our work concerns European lookback options with floating strike. They are a financial instrument giving the holder the right to buy (respectively to sell) an asset at maturity for its lowest (respectively its highest) price during its timelife.

We first present how to obtain the price at any time between emission and maturity using trees. We generalize a modelisation of Cheuk-Vorst that allowed only the evaluation at emission. From this modelisation we produce general formulas for the price of calls and puts.

Next we obtain an asymptotic expansion for the binomial cumulative distribution function if the evaluation is done around the half-size and if the sequence of the probabilities remains distant from 0 and 1 when the trees get bigger. This step is very important for the study of the convergence.

In a third part we study the speed of convergence of our adaptation of the Cheuk-Vorst modelisation to its evaluation by the continuous Black-Scholes model when the length of the tree increases. We show that this convergence is of order $\frac{1}{\sqrt{n}}$. To prove this we write the price as an asymptotic expansion in powers of $\frac{1}{\sqrt{n}}$ for which we obtain the precise value of the first three coefficients.

We finally look at some greeks, more precisely, the delta, the gamma and the theta for calls and puts for any nonnegative spot rate. A good approximation of these greeks can be obtained from trees. We provide methods that are based on previous work of Hull for path independent options. We show again the convergence of these approximations to their evaluations with the continuous model.

Will you defend your PhD soon? Do you have a student who is about to obtain his PhD?

Grab the opportunity to announce it in our Newsletter!

Next Newsletter will appear on May 15. The deadline for contributions is May 10. Contact Françoise Bastin <F.Bastin@ulg.ac.be> with title, abstract and defence date/place.

3 Job opportunity at UHasselt

Vacancy for a fixed position in analysis: see announcement at the end of this newsletter.

4 News from the EMS

Together with the national mathematical societies, the European Mathematical Society has the tradition of meeting every year with the aim to share views, hopes and worries concerning all aspects of the life of the European mathematical community.

This year the societies' meeting will be in Budapest over the weekend of April 2–3.

The meeting agenda is traditionally centered on a topic. This time the focus will be on problems of mathematical education.

If you would like to raise a question or have a suggestion, please contact Philippe Cara by e-mail (pcara@vub.ac.be).

5 Membership dues for 2016

In the previous newsletter we reminded you to renew your membership with the BMS. If you have not yet done so, please pay your dues as soon as possible.

The basic BMS membership fee is 20€ per year. Our website contains information about reciprocity membership and other fees.

You can either pay via bank transfer (**BIC: GEBABEBB / IBAN: BE70 0011 7447 8525**)
or via PayPal (see http://bms.ulb.ac.be/membership/paypal.php).

5.1 Checking your membership status

To check whether we have received your dues, go to our online database.

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 from our database as you are not a member anymore! In this case we suggest you to re-apply for membership by filling out the online form at http://bms.ulb.ac.be/membership/appliform.php and transfer your membership fee asap.

5.2 Address changes

If you would like to alter the information we use to communicate with you (e-mail and/or postal address) or anything else about your membership, you can either fill out the membership form at http://bms.ulb.ac.be/membership/appliform.php or simply contact the secretary of the Society at <bms@ulb.ac.be>.

5.3 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).

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

6.1 Book reviews

To read ... anytime!!, please find here some reviews from A. Bultheel and P. Levrie.

pi-trivia

(a present for π-day?)

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.
  Today you should eat pie, as everyone does. Or you should buy some pie for someone!
- . . . the number π is a mathematical constant that (still) is the ratio between the circumference of a circle and its diameter? The first 500 decimal digits of π are given by:

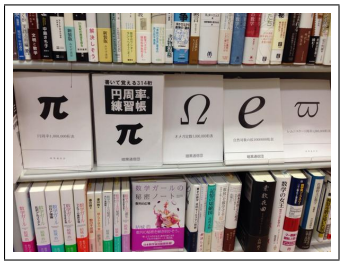
3.14159265358979323846264338327950288419716939937510582097494459230781
64062862089986280348253421170679821480865132823066470938446095505822317
25359408128481117450284102701938521105559644622948954930381964428810975
66593344612847564823378678316527120190914564856692346034861045432664821
33936072602491412737245870066063155881748815209209628292540917153643678
92590360011330530548820466521384146951941511609433057270365759591953092
18611738193261179310511854807446237996274956735188575272489122793818301
194913

  But are we sure it's a constant? Robert Scherrer doesn't think so: `http://arxiv.org/pdf/0903.5321v1.pdf`. He believes the value of π is changing in time, since it seems part of it leaks into a higher dimension.
- . . . real π-aficionados should go to Venice? You can buy real π-wine in Venice, as you can see on this picture taken in a local Trattoria.

- . . . there's a special bookcover with the digits of π? It comes in the form of a sheet of A3 size, with the first n decimal digits of π in a font that's only just legible. You can find it here:
  `http://mikaka.org/~kana/dl/pdf/piwrap.pdf`.

Here's a detail (in a scaled down version):

On that same website there's a lot of other, interesting things, for instance the biggest prime that is known at the moment. It's available as a pdf, 2234 pages in total. The prime number in question was only recently discovered, in January of this year. It's a Mersenne prime, with 22 338 618 digits. Of course the number π is also available, 1000000 digits, on 100 pages. A printed version seems to be available at the local (Japanese) bookshop:



- . . . 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. Don't believe what they say: $\frac{22}{7}$ is not equal to π.
  Since there isn't any order in the digits of π, the current records of memorising and reciting as many digits of π as possible, are surely spectacular. According to the Guinness Book of Records, the current record holder is a 21-year-old Indian student, Rajveer Meena. On March 21 2015 he recited the first 70,000 digits of π, blindfolded, in 9 hours and 27 minutes. But the real record is (probably) held by the Japanese 70-year-old engineer Akira Haraguchi, who knows 111700 digits by heart.
- . . . the shortest paper ever published in the notorious journal Physical Reviews has to do with π? These are the only 2 sentences in the paper in question: "*The most exact value at present for the ratio of proton to electron mass is 1836.12 ± 0.05. It may be of interest to note that this number coincides with* $6\pi^5 = 1836.12$".

- ... last year some new series for the number π were found? This is one of them:

$$\frac{\pi}{72} = \sum_{n=-3}^{\infty} \frac{(-1)^n}{(2n+1)(2n+7)(2n+13)}.$$

It's related to what is probably the oldest series for π, the Gregory-Leibniz series:

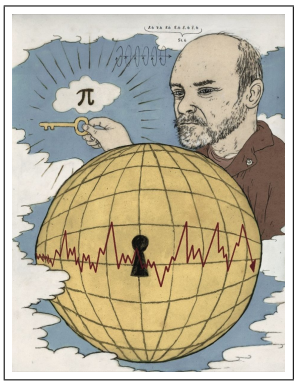
$$\frac{\pi}{4} = \sum_{n=0}^{\infty} \frac{(-1)^n}{2n+1}.$$

- ... recently a gap in the history of π has been filled? The history of π as related to the number of digits of π that were known at any given time, showed a gap in the eighteenth century. At the beginning of that century, John Machin had calculated 100 digits (by hand of course, since this is the pre computer era). By the end of that century, 136 digits were known. However, a persistent rumour said that someone had calculated 154 digits of π in the 18th century but never published them. You can even read it in the History of Mathematics by Montucla, a monumental 4-volume work dating from 1802:

page 633, où il donne les valeurs des séries. M. le baron de Zach a vu dans un manuscrit de la bibliothèque de Ratclif, à Oxford, le calcul poussé encore plus loin, et jusqu'à 155 chiffres; après 446, ajoutez 09 55058 22317 25359 40812 84802.

It was also known that the calculator in question was from Philadelphia.
It seems the rumour was true, since recently a manuscript with the value of π calculated correctly up to the 152nd digit, was found in the Bodleian Library in Oxford by Benjamin Wardhaugh. It dates from 1759, and there's no mention of the author.

- ... according to economist Martin Armstrong world economy fluctuates with a period of 3141 ($\approx 1000\pi$) days, or 8.6 years? Armstrong did a thorough study of the history between the years 1683 and 1907 and discovered that the economic climate gets better and better during a period of 8.6 years, but at the end of that period there's a big crisis. Using this Armstrong was able to predict to the day the crash of the stock markets in October 1987.



- ... there is a relationship between quantum mechanics and the number π? Recently 2 scientists, Tamar Friedmann and Carl Hagen, discovered that if you calculate the energy levels of the hydrogen atom in a special way, you get, as a by-product of that calculation, Wallis's product formula for π:

$$\frac{2}{\pi} = \frac{1\cdot 3}{2\cdot 2}\cdot\frac{3\cdot 5}{4\cdot 4}\cdot\frac{5\cdot 7}{6\cdot 6}\cdot\ldots.$$

Their paper appeared in the Journal of Mathematical Physics, it's 3 pages long, and it is the first paper in which the value of π is determined by quantum mechanical calculations.

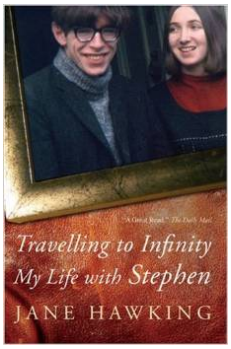
- ... recently (in 2014) a million digits of π where printed on a mile-long paper and rolled out on the runway of an airport in Denmark? Size 8 was used for the font, and only 8 ml of ink was needed.

- ... there exist formulae that bring together the constants π and e? This is one of them:

$$\lim_{n\to\infty} \prod_{k=1}^{2n+1} \left(1+\frac{2}{k}\right)^{k(-1)^{k+1}} = \frac{\pi e}{2}$$

(I'd like to thank Jolien, Hilde, Adhemar, Bart, and the others for their input!)

Traveling to infinity: My life with Stephen *Jane Hawking* Alma Books, 2007,2013, ISSN 978-1-84688-034-6, 450 pp.



Jane Hawking (2014)

This book is an abbreviated version of the longer story *Music to Move the Stars* (Macmillan, 1999). Jane was Stephen Hawking's first wife. They met in the 1960's while Stephen was preparing his PhD and Jane Wilde was studying Spanish and French. They married even though Stephen had been diagnosed with ALS and given only two more years to live.

In the books Jane describes how she experienced the 25 years she had been married to Stephen. She wanted to write her own story before the tabloids would make up one. Stephen left Jane to live with his nurse Elaine Mason in 1990. Stephen officially divorced Jane and married Elaine in 1995 and nine months later also Jane remarried. That was the period that Jane wrote her first version of the book. Stephen's second marriage also ended in a divorce in 2007. Then Jane revised her story which resulted in the shorter version of 2007.

Hawking family 1970's

It is of course Jane's story and it's a plea that justifies how she managed her marriage and to some extent deals with the injustice that in her mind was done to her. Whatever she did was in the service of the family and to the benefit of Stephen. So we learn how they met and Stephen got his ALS ordeal. Shortly after their marriage Stephen got his PhD in '66 in Cambridge. It was inspired by a lecture of Penrose and dealt with the singularity at the origin of our universe. Meanwhile Jane finished her studies commuting to London. But the deteriorating condition of his health did put a lot of strain on the household. Stephen's fame was strongly established when he developed the theory of Hawking radiation which stated that black holes did loose matter in the form of radiation. He was invited at many institutes all over the world. However Jane caught a fear for flying, so that she often preferred to stay at home and let Stephen go being looked after by his students. Certainly after the children were born: Robert (1967) and Lucy (1970), traveling, even for a vacation was a crusade bringing Stephen and the children to the car, stowing Stephen's wheelchair and loading the suitcases on top.

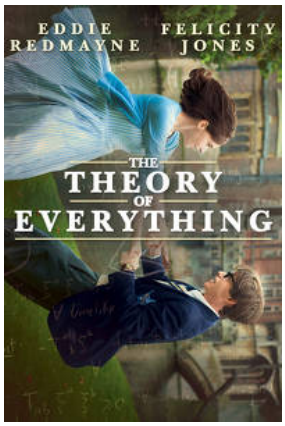
In between the nursing of Stephen and the children, she still tries to finish a PhD about Medieval Spanish poetry, but that is always delayed, while Stephen is only thinking about his career, claiming they are just a normal family, and refusing any external help. When Jane is advised to take some time for herself, she joined a church choir directed by the organist Jonathan Jones. Jonathan is widowered since his wife died of leukemia. Jane and Jonathan become soul mates, and Jonathan enters the Hawking family as a friend of the house when teaching piano lessons to Robert, but also helping to take care of Stephen. When a third child Timothy is born in 1979, rumors begin to spread and it triggers a break with the Hawking family. However the *ménage à trois* seems to work out in practice. When Stephen is flying out to visit CERN, Jane and Jonathan with the children follow by car, having some camping vacation in Belgium and Germany. However, there the news

reaches them that Stephen is kept in a coma in Geneva. The muscles in his throat had been a problem for a long time that regularly gave him a chocking fit. That would sooner or later cause his death, so it could only be solved by a tracheotomy, bypassing the sensitive area, but which of course deprives him of the possibility to speak. This had been a problem anyway because his voice had deteriorated considerably already and he had needed interpreters to make him understandable before. It is decided to operate and somewhat later the well known voice computer is introduced, which in the beginning, he operates by hand, nowadays with one remaining cheek muscle.

After that, nurses were hired to look after Stephen. Stephen's popular book *A brief history of time* was a big success and brought in a lot of royalties. He enjoyed the promotion of the book, placing him in the center of attention. Meanwhile Jane reports increasing tensions among the nurses competing for Stephen's favors, and she is gradually alienated from her husband. She meets the Queen when Stephen is appointed in the *Order of the Companion of Honours* in 1989 and that is about the swan song of their marriage. When at some point the royalties of the bestselling *A brief history of time* are not transferred to her but to Stephen's private account, she realizes that some borders had been crossed and that her marriage has come to an end. When an American film crew, making a documentary about the book, wants to add 'some biographical elements', they invade the house and Jane is obviously not in control anymore. The year is 1990 when Stephen informs Jane that he is leaving her to live with Elaine, thus ending twenty five years of marriage that was supposed to last for at most two.

Elaine and Stephen 1995

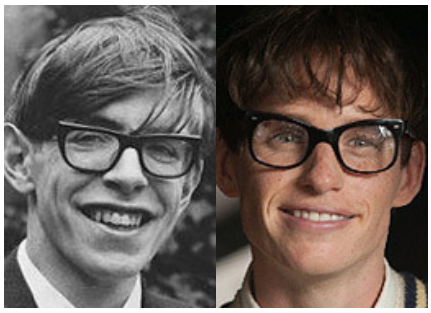
The theory of everything *James Marsh*, 2014, Working Title Films, 123 min.



This film is based on the previous book. However, the book has an amazing lot of details. Jane must have kept a diary or may have a very good memory, since there are so many precise recollections. Of course there are the many grand occasions when Stephen gets some prize or a medal or visiting the Pope, but there are many more ordinary everyday events that are told with precise quotes of who said what, how, when, and where. She complains about the strain put upon the children by Stephen and her concern about that. There are even excursions into the theoretical physics in the book although not in detail, but historical facts are more extensively elaborated like the story of Galileo and his row with the Catholic Church. Religion was a matter of friction between her, being religious, and Stephen, an ardent atheist. The book relates about her efforts for charitable causes, her energy put into the survival of the choir that was deprived of sponsoring under the Thatcher regime, some criticism on the Russian political situation when they visit Moscow, etc. Jane eventually finishes her PhD and starts teaching, and in the final stage of their marriage a house was bought in France where she escaped with the children when separation was imminent. No trace of all this in the film though.

The film concentrates on the romantic and emotional level. Of course Stephen and Jane falling in love, the tension with the Hawking family, the ambiguous relation with Jonathan, and the most dramatic events in their life such as the decision about the tracheotomy. Of course the moment that Stephen decides to leave Jane with Elaine, is the emotional climax at the end.

Jane



Stephen

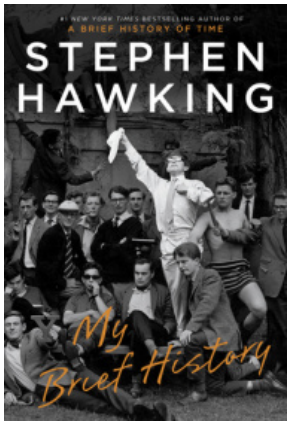
Marriage 1965

Actress Felicity Jones plays the main role of Jane but the performance of Eddie Redmayne as Stephen is exceptional. He got the *Best Actor Oscar* for it. Stephen Hawking congratulated him for this. Hawking's computer voice in the film is actually generated by the true speech generator of Stephen. The title of the film *The theory of everything* clearly refers to the attempt of theoretical physicists to find a unifying theory for the macroscopic laws of the universe and the microscopic laws studied in quantum mechanics.

Since Stephen's divorce from Elaine in 2006, Jane and the children maintained a 'working relation' with Stephen. The whole Hawking family was present at the London premiere of the film in December 2014.

Jonathan and Jane

My brief history *Stephen Hawking* Random House/Bantam Books, 2013, ISSN 978-0-345-53528-3, 144 pp.



Stephen also wrote a biography: *My Brief History*. This is a much shorter book than Jane's and it has many pictures. There is of course more information about Stephen's youth before he met Jane and there is definitely more physics and cosmology, although not really mathematics or formulas. Some of the events you will recognize from the corresponding account in Jane's book. There is even humor like for example Stephen offering a year subscription to *Penthouse* after a bet with a colleague. He also reveals that initially he approved Jonathan to live in his house since he expected that after his tracheotomy he would not live much longer and he also thought that Jane's depression was because she had the same idea, and then Jonathan could help Jane to look after the children when he died. The speech synthesizer that he has is outdated and much better software exists. It runs on hardware for which no more spare parts are available. However since he considers this voice as his trade mark, he still wants to keep the machines as long as they still run. Instead of speaking, the system can of course also store the sentence, and this is how he has written seven books and using LaTeX he could also store equations and he wrote several scientific papers.

We also learn about his marriage with Elaine. How he needed a laryngectomy to completely separate the windpipe from his throat and later also a ventilator 24 hours a day. A separate chapter is devoted to his writing of *A brief history of time* and an amusing analysis of the reviews it got. Remaining chapters deal with time travel, imaginary time, and the no boundary conditions, which allows the universe to spontaneously be created out of nothing.

He says his illness was an advantage that made him the scientist he is, the only downside is that it is hard to do something incognito. He did travel a lot all over the world and met many celebrities. In 2012 he was anchoring the London Paralympics. He obviously enjoys being at the center of it all.

A. Bultheel

The Faculty of Sciences, capacity group Mathematics and Statistics of Hasselt University, seeks a (m/f)

Tenured academic staff / Tenure track lecturer
Mathematical Analysis

Education task
The candidate will be in charge of courses in the direction of mathematical analysis, primarily in the bachelor of Mathematics. He/she will also teach service courses (general mathematical subjects) in various programs of UHasselt.

Research mission
The candidate will enforce the research capacity of the research group Dynamical Systems and broaden or deepen the existing expertise. The candidate's expertise has links with one or more research topics that are central in the research group, like singular perturbations, bifurcations, qualitative study of differential equations, convergent and divergent normal forms. Scientific collaboration in UHasselt and external collaboration is expected.

Profile
- The candidate shows good research potential in mathematical analysis, and preferably has research experience in the development of new theory and methodology in the context of dynamical systems and/or ordinary differential equations. This research experience is on the level of lecturer (tenure track/tenured).
- The candidate has a clear vision on and/or experience with international collaboration.
- The candidate has a clear vision on and/or experience with the following aspects of academic education: coordination and organisation of courses, development of course material and supervision of projects and theses.
- Academic personnel needs to adhere to the legal requirements concerning the teaching language (Dutch). Where needed, Hasselt University will assist in training to reach the minimal language requirements.

Diploma
Phd in mathematics.

Employment
- Either an appointment as a lecturer in the tenure track system during 5 years. This will lead to an immediate permanent contract as a senior lecturer, if the Board of Directors favorably assesses the party involved, based on previously set public grading criteria;
- Or a full-time appointment as a lecturer or higher, which will lead to tenure. In case of a first appointment as a member of the academic staff, the Board of Directors of the University can decide on a temporary appointment for a period up to 3 years. This will lead to a permanent contract if the Board of Directors favorably assesses the party involved.

Further information
Content job responsibilities:
Prof. dr. Peter DE MAESSCHALCK, +32-11-268223, peter.demaesschalck@uhasselt.be
Content terms of employment and selection procedure:
http://www.uhasselt.be/jobs

Application
You can only apply online up to and including **01 april 2016**, via the dutch announcement of the vacancy at http://www.uhasselt.be/vacatures_detail?taal=01&vacid=1021.

Selection procedure
Preselection on the basis of CV. Interview with, and test lesson by, the selected candidates.