Newsletter

BELGIAN MATHEMATICAL SOCIETY

103, May 15, 2015

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

From the editor

Welcome to this Newsletter! Have a nice summer time; we meet next September.

Regards,
Françoise

---

1 News from the BMS & NCM

You can follow `BelgianMathS` on twitter and tweet announcements or other interesting information to @BelgianMathS.

We also have a facebook page: https://www.facebook.com/BelgianMathS. Again, this page is your page! Please help us to keep it up to date and interesting by sending us nice links and information.

New logo, banner, website,...

Do you think we should improve our looks and our website? Do you have experience with designing websites or logos? Or you know someone who does?

Share your thoughts with the Steering Committee! Mail Philippe Cara at <pcara@vub.ac.be>.

2 Meetings, Conferences, Lectures

2.1 May 2015

Genericity and small sets in analysis

Esneux (Domaine du Rond-Chêne)

May 26-28, 2015

More information:
• F.Bastin@ulg.ac.be
• the web site at http://www.afo.ulg.ac.be/fb/meeting/genericity/

2.2 June 2015

Chaire de la Vallée-Poussin

UCL

June 1-5, 2015

More information:
• pascal.lambrechts@uclouvain.be
• the announcement at the end of this Newsletter

New trends in Hopf algebras and tensor categories

Royal Flemish Academy of Belgium for Science and the Arts — Brussels

2–5 June 2015

Keynote speakers are :
- Nicolás Andruskiewitsch — Universidad Nacional de Córdoba, Argentina
- Gabriella Böhm — Wigner Research Centre for Physics, Hungary
- George Janelidze — University of Cape Town, South Africa
- Hans-Jügen Schneider — Universität München, Germany

Organising committee
- Stefaan Caenepeel — Vrije Universiteit Brussel
- Marino Gran — Université catholique de Louvain
- Joost Vercruysse — Université libre de Bruxelles
- Albert Zhang — Universiteit Hasselt

For more information and registration, see announcement at the end of this Newsletter or conference website http://homepages.ulb.ac.be/~jvercruy/HA2015.

2.3 September 2015

Workshop in Category Theory and Algebraic Topology

UCL

10-12 September, 2015

This event is organised by UCL in collaboration with the Ecole Polytechnique Fédérale de Lausanne.

Invited speakers:
- Joachim Kock (Universitat Autònoma de Barcelona)
- Steve Lack (Macquarie University)
- Tom Leinster (University of Edinburgh)
- Sandra Mantovani (Università degli Studi di Milano)
- Ieke Moerdijk (Radboud Universiteit Nijmegen)
- Fernando Muro (Universidad de Sevilla)
- Emily Riehl (Harvard University)
- Tim Van der Linden (Université catholique de Louvain)

Informations: http://sites.uclouvain.be/ctat2015 (and see also the poster at the end of the Newsletter).

3 Job announcements

No jobs this time but please send us your job openings for the next issue!

Next Newsletter will appear on September 15. The deadline for contributions is September 10. Contact Françoise Bastin <F.Bastin@ulg.ac.be>.

4 PhD theses

Graded-commutative nonassociative algebras:
higher octonions and Krichever-Novikov superalgebras;
their structures, combinatorics and non-trivial cocycles

Marie Kreusch, University of Liège
Date and place: April, 2015, ULg

Thesis advisor and co-advisor: P. Lecomte (ULg) and V. Ovsienko (Reims)

Abstract: We choose the abelian group $(\mathbb{Z}_2^n, +)$ where $\mathbb{Z}_2 = \mathbb{Z}/2\mathbb{Z}$ and define a $\mathbb{Z}_2^n$-graded vector space $E = \bigoplus_{x\in\mathbb{Z}_2^n} E_x$ together with a multiplication $\cdot : E \times E \longrightarrow E$ respecting the grading

$$E_x \cdot E_y \subset E_{x+y} \quad \forall x, y \in \mathbb{Z}_2^n.$$

This is called a $\mathbb{Z}_2^n$-graded algebra. We are interested in particular $\mathbb{Z}_2^n$-graded algebras where the product is noncommutative and nonassociative.

This dissertation consists of two parts. The first one is the study of a series of $\mathbb{Z}_2^n$-graded algebras of finite dimension (which is 2^n) where $n \geq 3$. This series of real noncommutative and nonassociative algebras, denoted $\mathbb{O}_{p,q}$ ($p+q=n$), generalizes the algebra of octonion numbers $\mathbb{O}$. This generalization is similar to the one of the algebra of quaternion numbers in Clifford algebras. The first *question* is to classify these algebras up to isomorphisms. The classification table of $\mathbb{O}_{p,q}$ is quite similar to that of the real Clifford algebras $\mathcal{C}l_{p,q}$. The second *question* is to find a periodicity between these algebras. The periodicity for the algebras $\mathbb{O}_{p,q}$ is analogous to the periodicity for the Clifford algebras $\mathcal{C}l_{p,q}$.

In the second part we study $\mathbb{Z}_2$-graded algebras ($n=1$, also called "superalgebras") that can be of infinite dimension. We consider two kinds of superalgebras $\mathcal{L}_{g,N}$ and $\mathcal{J}_{g,N}$ that are noncommutative and nonassociative[1] generalizing the Witt algebra and its central extension, the Virasoro algebra. These superalgebras link together the classical Lie algebras and the classical commutative and associative algebras. The two last *questions* are can we "extend" the algebras $\mathcal{L}_{g,N}$ and $\mathcal{J}_{g,N}$? The first answer is yes (for $\mathcal{L}_{g,N}$), while the second one is no (for $\mathcal{J}_{g,N}$). However, we can "extend" the module $\mathcal{J}^*_{g,N}$.

Which infra-nilmanifolds admit an expanding map or an Anosov diffeomorphism?

Jonas Deré, KU Leuven Kulak, FWO Flanders

Date and place: Tuesday May 26th at 17h in aula B422 at KU Leuven Kulak

Supervisor: Prof. dr. Karel Dekimpe

Abstract: Expanding maps and Anosov diffeomorphisms are important types of dynamical systems since they were among the first examples with structural stability and chaotic behavior. Every closed manifold admitting an expanding map is homeomorphic to an infra-nilmanifold and it is conjectured that the same is true for manifolds admitting an Anosov diffeomorphism. Although, up to homeomorphism, infra-nilmanifolds are the only closed manifolds supporting an expanding map, not every infra-nilmanifold admits an expanding map. Similarly the existence of an Anosov diffeomorphism on an infra-nilmanifold puts strong conditions on its fundamental group.

This dissertation studies which infra-nilmanifolds admit an expanding map or an Anosov diffeomorphism. Because of the algebraic nature of infra-nilmanifolds, these questions are translated into studying the group morphisms of their fundamental groups, which are exactly the almost-Bieberbach groups. The main results of this essay give algebraic methods for deciding whether a given infra-nilmanifold admits an expanding map or an Anosov diffeomorphism. Using similar methods it also describes the set of periodic points for a general class of self-maps on infra-nilmanifolds.

Connecting hitting sets and hitting paths in graphs

Eglantine Camby, Université Libre de Bruxelles

Date and place: Tuesday June 30th at 14h in Salle Solvay NO5 at ULB

Supervisors: Prof. Dr. Samuel Fiorini and Prof. Dr. Jean Cardinal.

Abstract: In this thesis, we study the structural and the algorithmic side of different problems in graph theory. A graph is a set of vertices linked by some edges. First we consider two problems: the vertex

[1] The construction comes from spaces on a compact Riemann surface of genus g with N punctures.

cover problem and the dominating set problem, two special hitting set problems. A vertex cover is a set of vertices meeting all edges while a dominating set is a set X of vertices such that every vertex not in X is adjacent to a vertex from X. The connected version asks the induced subgraph to be connected. We investigate the price of connectivity for the vertex cover problem and dominating set problem. The price of connectivity gives us an indication on the cost to pay by adding the connectivity constraint to a problem. Formally, it is the ratio between the minimum size of the connected and the original versions. We prove the hardness of the price-of-connectivity computation and we characterize graphs whose price of connectivity is bounded by a small constant for every induced subgraph.

Secondly, we characterize the class of P_k-free graphs in terms of connected dominating sets. Many problems on graphs are studied when restricted to this class of graphs. We apply this characterization to the 2-colorability in hypergraphs. For some hypergraphs, we prove that this problem can be solved in polynomial time.

Finally, we deal with the P_k-hitting set problem. A P_k-hitting set is a vertex set meeting all paths with k vertices. We find a 3-approximation algorithm for the P_4-hitting set problem. This algorithm finds a P_4-hitting set such that its size is at most the triple of a smallest one. Our algorithm is based on the primal-dual method.

Skip-Free Markov Processes : Analysis of Regular Perturbations

Sarah Dendievel, Université Libre de Bruxelles

Date and place: June, 2015, ULB

Supervisors: Prof. Griselda Deelstra and Prof. Guy Latouche

Abstract: In this work, we use matrix analytics methods to

- analyze the effect of regular perturbations of the transition matrix on the stationary distribution of skip-free Markov processes;
- to determine transient distributions of skip-free Markov processes by performing regular perturbations.

In the class of skip-free Markov processes, we focus in particular on quasi-birth-and-death (QBD) processes and Markov modulated fluid models (MMFM).

We first determine the first order derivative of the stationary distribution of a QBD for which we slightly perturb the transition matrix. This leads us to the study of Poisson equations that we analyze for finite and infinite QBDs. The infinite case has to be treated with more caution therefore, we first analyze it using probabilistic arguments based on a decomposition through first passage times to lower levels. Then, we use general algebraic arguments and use the repetitive block structure of the transition matrix to obtain all the solutions of the equation. The solutions of the Poisson equation need a generalized inverse called the deviation matrix. We develop a recursive formula for the computation of this matrix for the finite case and we derive an explicit expression of the elements of it for the infinite case.

We also analyze the first order derivative of the stationary distribution of a MMFM. This leads to the analysis of the matrix of first return times to the initial level.

Finally, we study the cumulative distribution function of the level in finite time and joint distribution functions of the level and its maximum over a finite interval. We show that our technique gives good approximations and allows to compute efficiently those distribution functions.

5 Miscellaneous

5.1 Thomas Connor : Belgian GO Champion 2015 !

Fellow BMS member Thomas Connor is a brilliant young mathematician from the Université Libre de Bruxelles who is about to finish his PhD thesis at the Science Faculty. His highschool was Lycée Emile Jacqmain which he finished in 2006. He also got a 4th prize at the Olympiade Mathématique Belge that same year.

The game of GO is a Chinese strategical game. Some sources point out that it is 4000 years old. The board is a square 19×19 lattice. One plays on the 361 line intersections by putting white and black stones. The goal is to encircle parts of the board so that one has more territory than one's opponent, in the end. The number of players in the world is estimated to be 60 million. In Belgium, that figure is estimated at about one thousand. About one hundred of them are affiliated to the Belgian GO Federation.

Thomas started to play in 2004. He often played tournaments overseas like in China, Germany, Sweden, Italy, the Netherlands,... He represented Belgium on 3 international occasions (2007, 2008, 2010). In 2008, in the context of the Olympic Games in Beijing, a parallel tournament gathered around 200 players, including Thomas Connor.

In March this year, he became Belgian Champion 2015. Ten players met in the final round of this tournament: 5 of them were the first of the 2014 edition, while the remaining 5 qualified through another tournament of 11 players. One of them was Thomas. His result was unexpected as according to the European Go Database, he had only 10% of chance to win against the 2014 Champion Lucas Neirynck, student at the Université catholique de Louvain.

A well documented European rating is available at http://www.europeangodatabase.eu/EGD/

The "Fédération Belge de Go" which is also the "Belgische Go Federatie" was created in 1982. Connor was president in 2013 and is at present secretary. The main purpose of the federation is to gather players and to promote GO. The federal website provides a list of clubs and addresses: http://gofed.be. Beginners can start as soon as 7 years old. The simplicity of the rules makes it a very attractive game.

Interested people can contact Thomas Connor at tmfconnor@gmail.com.

Francis Buekenhout

5.2 Let 2015-2016 be IMAGINARY!

What do a lemon, a diabolo and a hummingbird have in common? You find an answer at IMAGINARY, ***an interactive mathematics exhibition.*** The first edition was organized in Germany, by the Oberwolfach Mathematics Institute. Since then, IMAGINARY became an international project, present online at http://imaginary.org, and with past exhibitions in 30 countries attracting more than 1 million visitors.

From September 28th 2015 onwards IMAGINARY will travel through Belgium for the first time, organized by the Flanders Mathematical Olympiad in collaboration with all universities of Flanders. The entrance to the exhibition will be free. The exhibition itself is appealing to a broad audience. As a visitor you will see a series of marvelous, well documented gallery prints, a number of 3D-objects printed especially for this exhibition by partner Materialise, and interactive software to simulate, visualize and even play on large touch screens.

Accompanying material for teachers will be made available and free guided tours at all locations will be offered to groups of secondary school pupils from age 14 on. These guided tours can be booked at http://www.imaginarymaths.be.

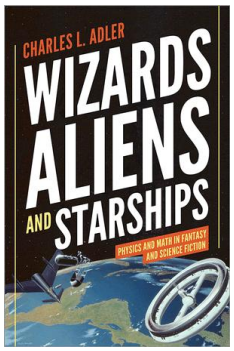
We hope to meet many Belgian mathematicians and many more non-mathematicians at the 2015-2016 IMAGINARY exhibition.

Paul Igodt – coordinator

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

To read during holidays–or anytime!– find here some reviews from A. Bultheel

Wizards, Aliens and Starships, physics and math in fantasy and science fiction. by *Charles L. Adler*. Princeton University Press, 2014, ISBN 978-0-691-14715-4 (hbk), 378 pp.



Charles L. Adler

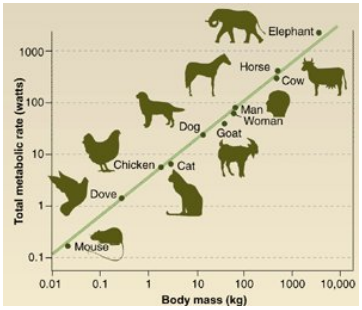
If you are a Harry Potter fan, did you ever believe that it was true that a person can be transformed into a ferret? Did you believe that dragons and monsters exist in real life? Or that people can just disappear? Probably not. Did you ever think of a reason *why* it is impossible? You've never seen it happen, but that is no reason why it is impossible. Adler gives some good reasons from first principles. If a person of 60 kg is transformed into a small animal of 2 kg, then a mass of 58 kg is gone. Physics conservation laws tell us that it must have been transformed into energy, and with Einstein's formula $E = mc^2$ this would be a hell of a big bang because the Hiroshima bomb is about the equivalent of 1 gram of matter. As much energy is required to undo the spell. Teleporting suffers of the same problem. "Beam me up Scotty" is not a sentence that will be spoken for real in our universe. Harry Potter's *reparo* evokes a mending charm to repair broken things or undo a chaotic situation. Again quite unlikely without the necessary energy because it is violating the second law of thermodynamics.

The *Hogwarts School of Witchcraft and Wizardry* being lit by thousands and thousands of candles floating in midair would make it still a very dark place. Adler computes the luminous efficacity of candles and it turns out to be miserable, not to speak of the cost of replacing the candles, and of all the dripping.

Similarly, Kleiber's law relates body weight and metabolism, and because the energy needed to fly is related to metabolism, this imposes an upper bound of about 20 kg for the largest possible biological fliers. Thus no large flying dragons can ever exist without engines.

This is the way Adler deals with magic and witchcraft in the first part of this book. With basic physical laws and some elementary computations, the impossibility of certain phenomena is actually proved. The main part of the book deals however with science fiction. This genre is obviously the place where (pseudo) science is an essential part of the plot. The most extensive part of the book deals with space travel. More speculative is the search for and the design of extra-terrestrial worlds. The last part takes a glimpse at the distant future of humanity in the stellar system and the possible cosmological endings.

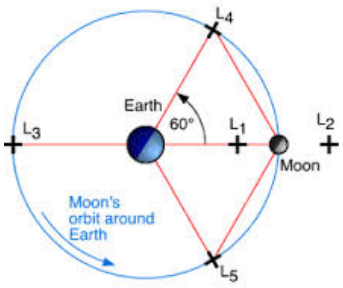
Hogwarts lights



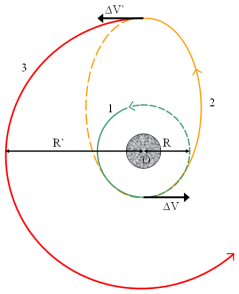
Kleiber's law

Let's start with space travel. For the moment we are using rockets with chemical fuel burning propulsion to leave the earth. The technology did not change too much since its origin which is very much unlike the spectacular evolution of computers. Adler explains why. Cruising the nearby space raises energetic problems. For every gram brought into space there is an enormous overload for fuel needed. Space colonies of some 10,000 people have their own problems of providing breathable air, food and water, and gravity. Moreover one has to find a good spot to build it if it should be in an orbit around the earth. This forces us to choose the Lagrange points which are positions that give periodic solutions in an oth-

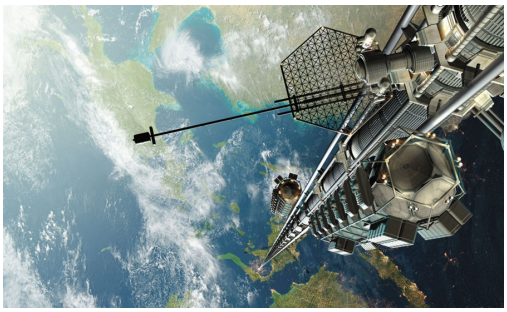
erwise chaotic three body problem with the earth and the moon. But why would one do that in the first place? Mining or the special conditions for production are often used as an argument, but a simple financial calculation makes this rather unlikely to be profitable. If rocket launching is too expensive, and if a station is up there, then why not instal an elevator. Some calculations also put a limit to that. A tower on earth is excluded because the basis it requires would be far too wide, and when it 'hangs' from the station then there is a limit to what will not collapse under its own weight. The furthest one gets in this line of thought is carbon nanotubes. For interplanetary travel, Adler works out the currently used physics of the Hohmann transfer orbit where the space ship leaves one smaller planetary orbit to join a larger one. Possibly use can be made of the gravitation of intermediate planets with a slingshot effect.



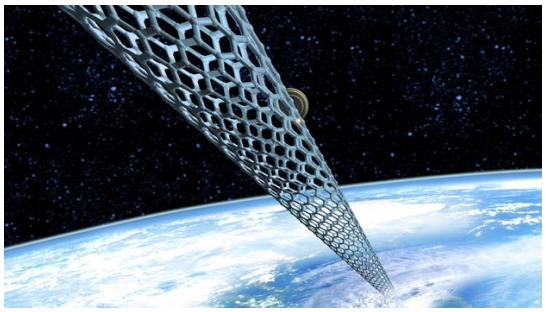
Lagrange points L_1–L_5



Hohmann transfer orbit

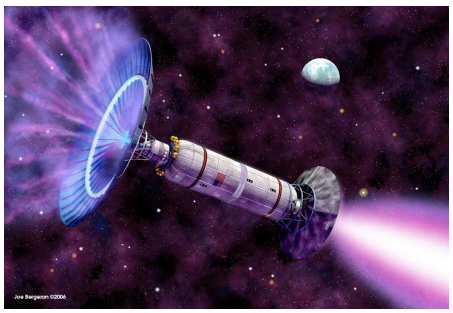


space elevator



carbon nanotube elevator

But if we are traveling farther away from home, then it's not only a matter of getting there but also of getting there during a human lifetime, and then other propulsion systems are in order. In that case burning will not be enough. Nuclear power is one possibility that was taken up by NASA in the 1960's. The problem is how to use it. An enormous amount of energy is delivered in a very short time which would squeeze the astronauts to jelly unless it can be controlled. The Bussard ramjet is an alternative. The idea is that it scoops up the atoms in space to be used as fuel in a fusion engine. Matter-antimatter use is a speculative alternative, which would cause a serious radiation problem. For interstellar travel, we should be able to accelerate to almost the speed of light, by constant acceleration while leaving, and constant deceleration before arrival. Of course relativity theory will play an important role. One chapter deals with travel faster than light (FTL). According to general believe and ample evidence, this is impossible, but suppose it were, then it would also be possible to travel in time, with problems of what is the cause and what is the consequence since notions of first and last become relative. This is also the chapter where Adler explains about black holes, wormholes are exotic matter.



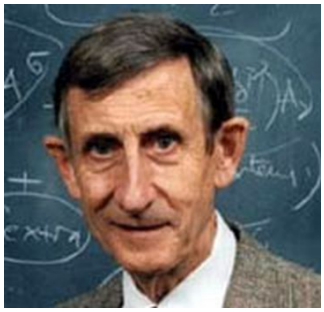
Bussard ramjet

In the third part of the book, Adler considers alternative places where humans could live. First he computes an acceptable distance of an earth-like planet from its star. Given the number of stars, there is a large number of such planets. However, this is not the only condition for life to be possible. It is the whole history of the planet that has to be taken into account. Given a star of a proper size, and a planet at a proper distance, it needs atmosphere, a solid soil, the right temperature changes, right orbital eccentricity, etc. and it is not excluded that accidents in the history like the impact that we ex-

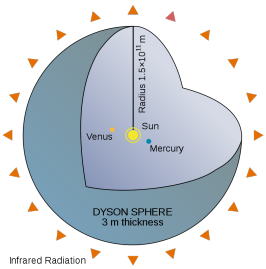
perienced when our dinosaurs were wiped out had as a consequence that we humans got the chance to develop to what we are now. But still, suppose there are some planets with all these properties, how are we going to find them since they are dark objects near bright stars? There are appropriate techniques for doing that as Adler explains. He also makes a model of which civilisations of aliens would be able to make contact and why they would ever want to contact us or explore space. The SETI project is *Searching for ExtraTerrestrial Intelligence* but it has not been successful till now.

SETI antennas

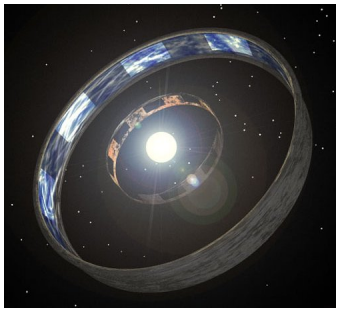
The last part is a view of what lies waiting for us out there in the distant future. Of course that is if we survive our immediate treads like global warming, nuclear war, the end of oil resources, etc. Can we then build a new home somewhere else? For example when our sun is growing in a later stage. Take for example Venus or Mars. Then we need to generate soil, to manage the temperature, to generate oxygen etc. Several other much more ambitious projects have been proposed. If in an even later stage of our sun it is cooling down, Freeman Dyson has proposed to build a sphere around the sun. That is a shell of 3 m thick and with a radius of 1 astronomical unit (= distance sun-earth) to catch all energy that it is still radiating. This would need enormous quantities of mass, for which we would need to tear apart the planets in our solar system. Another possibility is the Ringworld of Larry Niven. That is a ribbon instead of a sphere, however Adler's computations show that this would require more mass than the sphere. A manifest problem is the stability of such structures, both dynamic and static. Such enormous projects require civilisations that can be classified on the *Kardashev scale*. A type I civilization can use the energy of its entire planet, type II can use the energy of its star and type III the energy of its galaxy. Our civilisation ranks as type 0.7 approaching type I. The Dyson sphere or the Niven ringworld would require a type II civilization. That type would also be able to move the earth to a different orbit. In a last chapter, Adler gives an idea what could happen at the very end. In the 'short term' ($\approx 5 \cdot 10^8$ years) we might expect for example another astroid impact of the type that wiped out the dinosaurs, on a 'medium level' (up to 10^{13} years) we could perhaps move the earth, and in the 'long term' vision, the universe may consist of only black holes which may eventually evaporate.



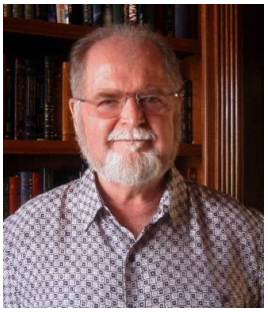
Freeman Dyson



Dyson sphere



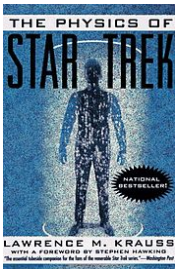
Niven ringworld

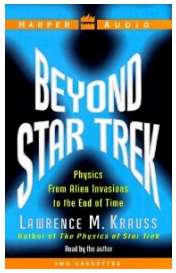


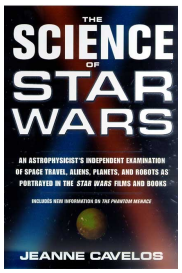
Larry Niven

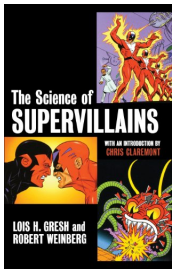
Working through this book brings you down to earth from the adventure story you are reading by explaining what is possible and most of the timed what is not and it gives good reasons why. On the other hand, it discusses also topics that go beyond your wildest dreams as an SF adict. The scale of the problems make you dizzy with very long sequences of zeros pushing some digits into oblivion. With a little bit of feeling for physics and for mathematics, it provides a wonderful playground inviting for further exploration. A Disneyworld where fantasy and SF are brought down to earth. And as a bonus, you get some guide to the SF literature and films: Arthur C. Clarke, Philip K. Dick, Ursula Le Guin, Robert A. Heinlein, Larry Niven, Star Trek, Babylon 5, Star Wars, Avatar,... and many other delicatessen.

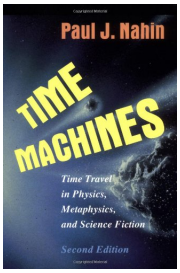
Note however that this is not the first book devoted to these subjects. The science of fantasy and science fiction, is not the final frontier, where this author goes, many others have gone before. See the list below which is just a sample because there are many more and there are many websites dealing with these subjects.

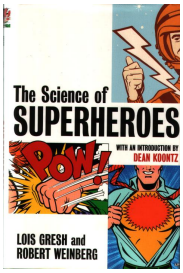


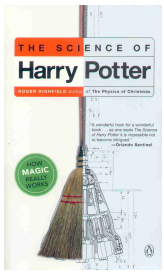


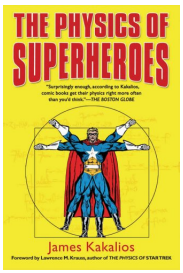


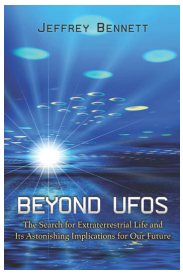


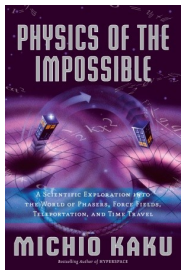


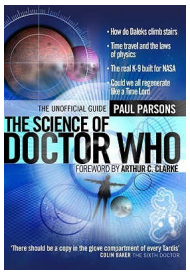


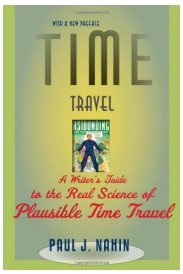












References

[1] Lawrence M. Krauss. *The Physics of Star Trek.* HarperPerennial, 1995.

[2] Lawrence M. Krauss. *Beyond Star Trek.* Basic Books, 1997.

[3] Jeanne Cavelos. *The Science of Star Wars: An Astrophysicist's Independent Examination of Space Travel, Aliens, Planets, and Robots as Portrayed in the Star Wars Films and Books.* St. Martins's Press, 2000. *Scientific American* brought several exerpts from this book. See http://www.scientificamerican.com/article/the-science-of-star-wars/.

[4] Lois H. Gresh. *The Science of Supervillains.* Wiley, 2001.

[5] Paul J. Nahin. *Time Machines: Time Travel in Physics, Metaphysics, and Science Fiction.* Springer, 2001.

[6] Lois H. Gresh and Robert Weinberg. *The Science of Superheroes.* Wiley, 2003.

[7] Roger Highfield. *The Science of Harry Potter: How Magic Really Works.* Penguin Books, 2003.

[8] James Kakalios. *The Physics of Superheroes.* Gotham Books, 2005.

[9] Jeffrey O. Bennett. *Beyond UFOs.* Princeton University Press, 2008.

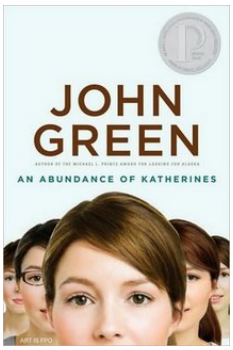
[10] Michio Kaku. *Physics of the Impossible: A Scientific Exploration Into the World of Phasers, Force Fields, Teleportation, and Time Travel.* Doubleday Publishing, 2008.

[11] Paul Parsons. *The Science of Doctor Who.* Johns Hopkins University Press, 2010.

[12] Paul J. Nahin. *Time Travel: A Writer's Guide to the Real Science of Plausible Time Travel.* Johns Hopkins University Press, 2011.

A. Bultheel

An abundance of Katherines. by *John Green*. Speak / Penguin USA, 2006, ISBN 978-0-14-241202-2 (pbk), 229 pp.

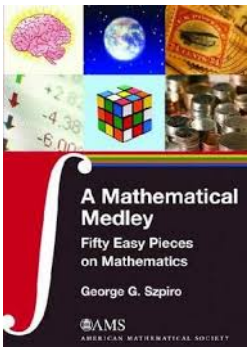


John Green

In chapter 20 of his *A mathematical medley*[1], Szpiro tells the story of Daniel Biss, a brilliant student of mathematics, with a PhD from MIT. His landmark papers on Grassmannian manifolds were published in 2003 in *Annals of Mathematics* and *Advances in Mathematics*. Then suddenly he decided to move to politics. One reason may have been that Nikolai Mnev from the Steklov Institute Saint Petersburg had detected an error in Biss's paper. At first Biss promised to work out a correction, but that took several years, and it turned out that it was impossible to mend the problem. Other mathematicians were already starting to build on the results of Biss. Tired of waiting, Mnev uncovered the mistake on the Internet in 2007. Biss had to admit his failure and it took one more year for the journals to publish an erratum. Only in 2009 were the erroneous papers withdrawn from the webpages of the journals. Biss lost the election in 2008, but served as a representative later from 2011 to 2013[2].

John Green is an author of fiction mainly for young adults. He won in 2006 the *Printz Award*[3] for his debut of 2005 *Looking for Alaska*. In the same year his second novel *An abundance of Katherines* was published. The plot describes the adventure of Colin Singleton (with an obsession for anagramming) and his friend Hassan Harbish (a lazy obese muslim with an obsession for Judge Judy[4]) while they take a road trip after graduation at high school and before entering college. They end up in Gutshot, some little town in Tennessee and are employed in a tampon string factory and live with the female owner and her daughter. There are some love affairs going on, but one may wonder what this has got to do with Daniel Biss and mathematics.

Daniel Biss



A Math. Medley

Well Colin has a very high IQ and considers himself a child prodigy. He is looking for his breakthrough that will turn him into a recognized genius. He has been dating 19 Katherines, who all have dumped him and he is now working out a theorem that will predict in a relation who will dump who and when. It is somewhat unclear what this would actually look like, but Colin is constantly working on his theorem and in the text you see several graphs appear and even a formula (no explanation given)

$$-D^7x^8 + D^2x^3 - \frac{x^4}{A^5} - Cx^2 - Px + \frac{1}{A} + 13P + \frac{\sin(2x)}{2}\left[1 + (-1)^{H+1}\frac{(x+\frac{11\pi}{2})^H}{|x+\frac{11\pi}{2}|^H}\right].$$

The graphs mostly look like an almost convex or concave function intersecting the x-axis at 2 points. These points define the start and the finish of the relation, and when the derivative is positive at the endpoint, the boy will break up and when it is negative the girl will end the relation. In the end it turns out that his theorem is wrong since Katherine III did not break up with him as he had remembered it, but he ended that relation himself, which destroyed his theory.

What has Biss got to do with this? In an end-note Green admits he is a mathematical disaster but Biss is a good friend and Biss (signing as Assistant professor of Chicago and Research fellow of the Clay Mathematical Institute, which he actually was at that time) wrote an appendix in which he describes, tongue in cheek, basically how to draw a parabola $D^3x^2 - D$ (D represents the dumper/dumpee differential). A quite amusing story and fun to read, but there is no true math here, just some make-belief gibberish pretending to be mathematics.

A. Bultheel

[1] G.G. Szpiro, *A mathematical medley* (AMS, 2010), reviewed in this Newsletter, issue 81, Jan. 2011.
[2] `en.wikipedia.org/wiki/Daniel_Biss` last accessed April 6, 2014.
[3] An annual award for best book for teens.
[4] An American reality court-show.

UCL
Université
catholique
de Louvain

École de mathématique
Institut de recherche
en mathématique et physique

CHAIRE DE LA VALLÉE POUSSIN | **2015** |

Professeur

Dror Bar-Natan

Université de Toronto, Canada

Dror Bar-Natan a obtenu son Doctorat à Princeton, sous la direction de Edward Witten. Avant d-être professeur à l'Université de Toronto il a été Assistant Professor a Harvard et Associate Professor à Jerusalem.

Parmi ses intérêts de recherche, il a fait des contributions influentes dans la théorie des nœuds, des invariants de type fini, et l'homologie de Khovanov.

Toutes les leçons seront données en l'auditoire Charles de la Vallée Poussin (CYCL 01) du bâtiment Marc de Hemptinne, chemin du Cyclotron, 2 à Louvain-la-Neuve

Renseignements : **www.uclouvain.be/math**
École de mathématique
010 47 33 12 **ou** carine.barasuclouvain.be

Expansions

Dror Bar-Natan

Lundi 1 juin 2015 à 16h30
Inaugural lecture
followed by a reception
The Kashiwara-Vergne Problem and Topology

Mardi 2 juin 2015 à 15h00
Lecture 2
From Knots to Lie Algebras

Mercredi 3 juin 2015 à 15h00
Lecture 3
Chern-Simons Theory and Feynman Diagrams

Jeudi 4 juin 2015 à 15h00
Lecture 4
Knotted Trivalent Graphs and Associators

Vendredi 5 juin 2015 à 15h00
Lecture 5
Back to 4D

It is less well known than it should be, that the standard notion of an expansion of a smooth function on a Euclidean space into a power series ("the Taylor expansion") is vastly more general than if first seems ; in fact, it is almost ridiculously more general. In my series of talks I will concentrate on expansions for knotted objects in 3 and 4 dimensions, on how these expansions relate these objects to problems in Lie theory, and on how these expansions may be constructed using tools from quantum field theory (which in themselves are "expansions").

UCL
Université catholique de Louvain

École de mathématique
Institut de recherche en mathématique et physique

CHAIRE DE LA VALLÉE POUSSIN | 2015 |

Dror Bar-Natan

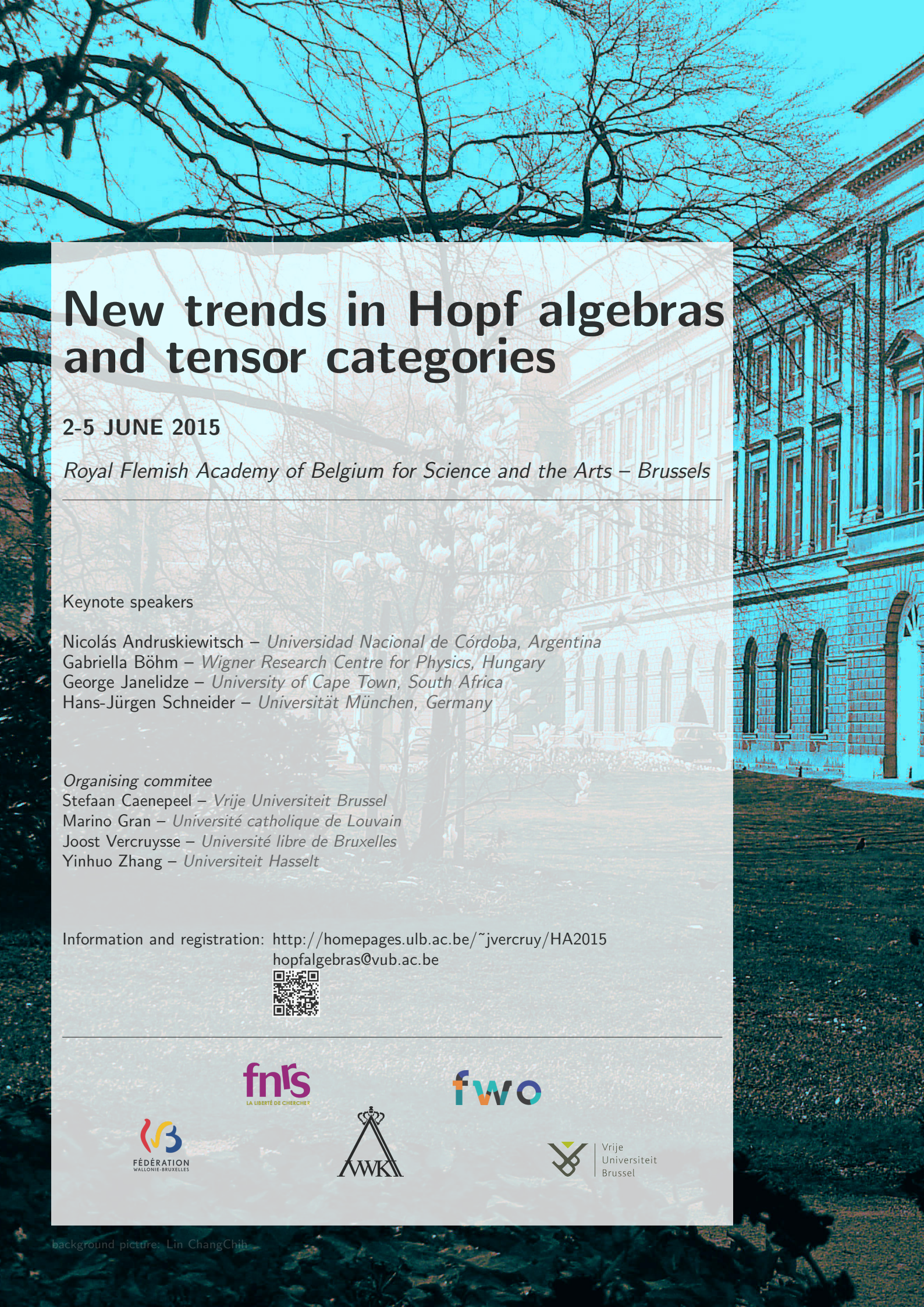
Université de Toronto, Canada

Expansions

- Lundi 1 juin 2015 à 16h30
  Inaugural Lecture followed by a **reception**
  The Kashiwara-Vergne Problem and Topology
- Mardi 2 juin 2015 à 15h00
  From Knots to Lie Algebras
- Mercredi 3 juin 2015 à 15h00
  Chern-Simons Theory and Feynman Diagrams
- Jeudi 4 juin 2015 à 15h00
  Knotted Trivalent Graphs and Associators
- Vendredi 5 juin 2015 à 15h00
  Back to 4D

Toutes les leçons seront données
en l'auditoire Charles de la Vallée Poussin (CYCL 01)
du bâtiment Marc de Hemptinne,
chemin du Cyclotron, 2 à Louvain-la-Neuve

Renseignements : **www.uclouvain.be/math**
École de mathématique **010 47 33 12** ou **carine.baras@uclouvain.be**



New trends in Hopf algebras and tensor categories

2-5 JUNE 2015

Royal Flemish Academy of Belgium for Science and the Arts – Brussels

---

Keynote speakers

Nicolás Andruskiewitsch – *Universidad Nacional de Córdoba, Argentina*
Gabriella Böhm – *Wigner Research Centre for Physics, Hungary*
George Janelidze – *University of Cape Town, South Africa*
Hans-Jürgen Schneider – *Universität München, Germany*

Organising commitee
Stefaan Caenepeel – *Vrije Universiteit Brussel*
Marino Gran – *Université catholique de Louvain*
Joost Vercruysse – *Université libre de Bruxelles*
Yinhuo Zhang – *Universiteit Hasselt*

Information and registration: http://homepages.ulb.ac.be/~jvercruy/HA2015
hopfalgebras@vub.ac.be

---

fnrs LA LIBERTÉ DE CHERCHER

fwo

FÉDÉRATION WALLONIE-BRUXELLES

KWK

Vrije Universiteit Brussel

background picture: Lin ChangChih

Workshop in

Category Theory and Algebraic Topology

10–12 September 2015

Université catholique de Louvain,
Louvain-la-Neuve, Belgium

Joachim Kock, UAB, *Barcelona*
Stephen Lack, Macquarie, *Sydney*
Tom Leinster, *Edinburgh*
Sandra Mantovani, Unimi, *Milano*
Ieke Moerdijk, RU, *Nijmegen*
Fernando Muro, US, *Sevilla*
Emily Riehl, Harvard, *Cambridge, MA*
Tim Van der Linden, UCL

sites.uclouvain.be/ctat2015

Université catholique de Louvain
École Polytechnique Fédérale de Lausanne

Contact: *kathryn.hess@epfl.ch*, *marino.gran@uclouvain.be*

éditeur responsable Tim Van der Linden, Kapellenkouter 76, BE-2070 Zwijndrecht
photographie Tim Van der Linden *graphisme* Rhythmus.be

CUSO
CONFÉRENCE UNIVERSITAIRE DE SUISSE OCCIDENTALE

EPFL
ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

UCL
Université catholique de Louvain

IRMP