Newsletter

BELGIAN MATHEMATICAL SOCIETY

Comité National de Mathématique CNM

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NCW Nationaal Comité voor Wiskunde

105, November 20, 2015

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

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Contents

From the editor

Welcome to this November Newsletter! Have a nice winter-time!

Regards,
Françoise

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1 News from the BMS & NCM

1.1 General Assembly of the BMS: November 18, 2015

The general assembly of the BMS was held a few days ago in Leuven.

During this general assembly, the president gave an overview of the highlights of the past year. In January the BMS organised a pre-screening of the movie "The Imitation Game", which was a big success. Important was also the Francqui Prize wich was awarded to Stefaan Vaes. A minute of slience was held for the victims of the recent terror attacks in Paris.

In 2016 two joint conferences are planned: the "Nederlands Mathematisch Congres" (March 22–23, with the Dutch Mathematical Society) and "II Encuentro conjunto BMS-RSME-SML" (June 6–8, with the Spanish and Luxemburg Mathematical Societies). More details on the latter in section 1.2.

A new executive committee of the society was elected (January 2016 – December 2018). Here is the list of the members (alphabetical order):

- Françoise Bastin, ULg
- Denis Bonheure, ULB
- Adhemar Bultheel, KUL
- Stefaan Caenepeel, VUB (Editor in Chief of the Bulletin)

- Pierre-Emmanuel Caprace, UCL
- Philippe Cara, VUB (President)
- Camille Debière, UCL (Managing Editor of the Bulletin)
- Karel Dekimpe, KUL-Kortrijk
- Peter De Maesschalck, UHasselt (Secretary)
- Karl Grosse-Erdmann, UMons
- Renaud Lambiotte, UNamur (Facebook/Twitter manager)
- Pascal Lambrechts, UCL (Editor of the book reviews)
- Christian Michaux, UMons
- Jean Van Schaftingen, UCL
- Stefaan Vaes, KUL
- Guy Van Steen, UA (Treasurer)
- Leo Storme, UGent
- Yvik Swan, ULg (Vice-president)
- Joost Vercruysse, ULB
- Jasson Vindas, UGent
- Andreas Weiermann, UGent

Some members decided not to continue to serve in the executive committee. The Society thanks them for their valuable support over the past years and hopes they will continue to be member of the BMS and will keep promoting mathematics in every possible way.

Welcome to Karl Grosse-Erdmann who will replace Catherine Finet in the committee.

For the future the BMS should increase its visibility in the media and elsewhere. The Society should have an opinion on current issues related to mathematics. *For this we need members who watch the press and other media and react quickly.* Last year a first step was taken in order to make Flander's decision makers aware of the huge shortage of mathematics teachers for highschools.

The BMS is now also present in the social media! 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. This page is your page! Please help us to keep it up to date and interesting by sending us nice links and information.

Thanks to Yvik Swan and Renaud Lambiotte for taking care of our social media!

In 2017 we plan to organise a joint conference with the Math teacher's associations SBPMef and VVWL.

In 2018 or 2019 there will be a joint conference with the Polish Mathematical Society.

How can you help us? Please feel free to comment on the above topics or make other propositions! You can send all your comments or suggestions to Philippe Cara <pcara@vub.ac.be>.

After the General Assembly the attendants were invited to visit the IMAGINARY exhibition.

1.2 Joint meeting with Spanish and Luxemburg Math Societies: June 6–8, 2016

The scientific committee has been working out the details of our joint conference. Here is some information.

Fees: There will be a conference fee of 60 euros. Lunch can be purchased at 12 euros per day.

Location: La Rioja is famous for gastronomy (and wine), in particular evening "tapas" are delicious and not expensive.

The conference will be held in "Rioja Forum" (http://riojaforum.com/en/community/riojaforum) at least for the opening day (and the reception). The second and third days will probably take place at the University Campus http://www.unirioja.es/universidad/presentacion/campus.shtml (the distance between both places is very small).

Scientific Committee: José Bonet Solves, Valencia Polytecnic Unversity • Antonio Campillo, University of Valladolid • Philippe Cara, Vrije Universiteit Brussel • Victor Lanchares, La Rioja University • Christian Michaux, University of Mons • Antonio Rojas León, Sevilla University • Martin Schlichenmaier, University of Luxemburg

Plenary speakers:

- María Jesús Carro (Luxembourg), *Valdivia Lecture*
- Johannes Nicaise (Leuven)
- Raf Cluckers (Paris 7)
- Sara Arias de Reyna (Luxembourg)
- Isabel Fernandez (Sevilla)
- Anton Thalmaier (Luxembourg)
- Sergei Merkulov (Luxembourg)

Parallel sessions:

- Functional analysis
- Model Theory and applications
- Algebra and number theory
- Partial differential equations
- Algebraic geometry and singularities
- Dynamical Systems and ODE

- Probability and Statistics
- Orthogonal polynomials and special functions
- Combinatorial and computational geometry
- Geometric Analysis, Differential geometry – quantization

2 Meetings, Conferences, Lectures

2.1 December 2015

Workshop "Facets of quantum homogeneous spaces"

3-4 December 2015, VUB, Brussels

See the poster at the end of this Newsletter

Meeting of the FNRS-contact group "Wavelets and applications"

University of Liège, Institute of Mathematics

Tuesday December 15, 2015

- Main speakers: Alain Arneodo, Bruno Torresani, Béatrice Vedel.
- See the poster at the end of this Newsletter.
- More speakers will deliver a short talk (the full list is not yet available).
- For more information, contact F. Bastin (F. Bastin@ulg.ac.be), C. de Mol (demol@ulb.ac.be) or Samuel Nicolay (S.Nicolay@ulg.ac.be).
  If you want to register (no fee but it is necessary to register for practical reasons — lunch and so on), please contact C. de Mol before December 10, 2015.

2.2 May 2016: Meeting for Bourgain

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

3 Job announcements

3.1 From KUL

KU Leuven is advertising several postdoc and PhD positions in pure mathematics. They are looking for motivated postdoctoral and PhD researchers in one of the following areas:

- Algebraic geometry
- Algebraic topology and group theory
- Classical analysis
- Differential geometry
- Functional analysis

More information on these positions and how to apply can be found at
http://wis.kuleuven.be/methusalem-pure-math/phd-positions

The deadline for applications is December 6, 2015

4 PhD theses

Characterising substructures of finite projective spaces
by
Sara Rottey, Vrije Universiteit Brussel, Universiteit Gent

Thesis supervisors: Prof. dr. Philippe Cara, Prof. dr. Leo Storme and dr. Geertrui Van de Voorde.

Public defence: Wednesday 16 December, 2015 at 15h in room D.2.01 (promotiezaal) of the VUB campus Etterbeek.

Summary.

In this thesis, we study several substructures in finite geometry, that is, structures contained in the Desarguesian projective space $\mathrm{PG}(n,q)$ over the finite field $\mathbb{F}_q$.

First, we investigate pseudo-caps and weak eggs, these are the higher dimensional equivalent of caps and ovoids. We provide conditions on element induced spreads that ensure these structures are contained in a Desarguesian spread. Next, focussing on the Desarguesian spread itself, we obtain a geometric characterisation in terms of the normal elements of the spread.

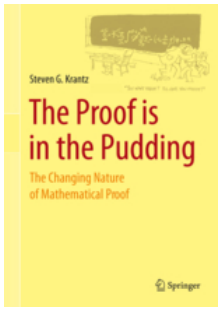
We also consider linear representations $T^*_{n-1}(\mathcal{K})$, these are point-line incidence structures embedded in $\mathrm{PG}(n,q)$ and completely defined by a point set $\mathcal{K}$ at infinity. If the set $\mathcal{K}$ contains a frame, the full automorphism group of this structure is found. Moreover, using the corresponding incidence graph, we construct new infinite families of semisymmetric graphs.

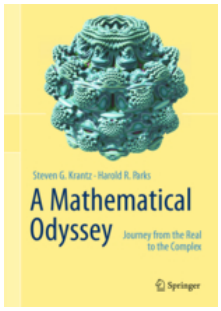
Lastly, we consider substructures in the André/Bruck-Bose representation of $\mathrm{PG}(2,q^n)$ in $\mathrm{PG}(2n,q)$. We investigate the representation of $\mathbb{F}_{q^k}$-sublines and $\mathbb{F}_{q^k}$-subplanes of $\mathrm{PG}(2,q^n)$ and obtain a characterisation of the ovoidal Buekenhout-Metz unital of $\mathrm{PG}(2,q^2)$ in terms of its Baer secants.

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

To read during the long "winter evenings" ...or anytime!!, please find here some reviews from A. Bultheel.

The Proof is in the Pudding, The Changing Nature of Mathematical Proof, 2011, Springer Verlag, ISBN 978-0-387-48744-1 (hbk), 264 pp. by *Steven Krantz*
A Mathematical Oddysey, Journey from the Real to the Complex, 2014, Springer Verlag, ISBN 978-1-4614-8938-2 (hbk), 398 pp. by *Steven Krantz & Harold R. Parks*





Steven Krantz

Of course the title of the first book is a wrong English idiom. You know it is incorrect, and yet you immediately know what is meant by it. Does this not remind of the way we read mathematical proofs? We know there are obvious steps omitted or the formulation is slightly wrong, but as long as we know what is meant we let is pass. So this brings us to the question: what is a mathematical proof, and when do we consider a proof to be correct.

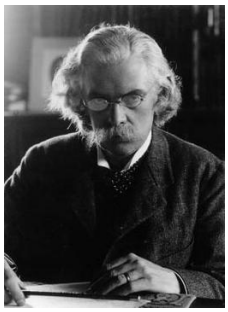
The first book under review is an attempt to answer these questions. So the first chapter starts with some general ideas: the Platonic versus the Kantian view of mathematics, the role of conjectures, some elementary rules from (formal) logic, the role of (computer) experiments, etc. Then follows a sequence of chapters that follow more or less the historical development of mathematics. It starts with the Greek with their geometric approach to mathematics. The algebra, zero and infinity are heritages of the Arabs. Dirichlet is identified to lay the foundations of a rigorous proof (Although born in Düren, Germany, his full name is Peter Gustav Lejeune Dirichlet because his family is originally from Richelette, close to Liège, and hence he has some Belgian roots.) He was also the first to give a precise definition of a function. It is remarkable that Krantz makes Riemann a student of Dirichlet (p. 57), although all other sources identify Gauss as his supervisor. Gauss plays only a back plan role in this book, but so are many other big names.) The golden 19th century for mathematics is quickly skipped to move on with Hilbert and the 20th century. It is also the start of an American school of mathematics (Birkhoff, Wiener) where before it was France and Germany that formed the breeding ground for mathematical development. The American school was much more engineering (applied) oriented. (Krantz makes an interesting excursion to explain why America is currently the mathematical center of the world and compares the European and American tradition.) To return to the methods of proving: the Brouwer fixed point theorem has an existence proof that is not constructive although later in life he converted to constructivism. It is also a proof by contradiction, a proof technique later contested by Errett Bishop, the founder of constructive analysis. And of course the story of Nicolas Bourbaki and their approach to mathematics is fully told. An incentive to study the foundations of mathematics was given by several paradoxes (Bertrand, Banach-Tarsky, Monte Hall). The next step is the introduction of the computer in the history of the solution of the 4-colour problem, and the Turing machine leading to Gödel's incompleteness theorems. Krantz spends several chapters on the role of the computer in education, in proving new results, for generating graphics, and in typesetting mathematical papers. Famous problems get attention: classification of finite groups, the Bieberbach conjecture, the sphere packing problem, foliation theory, Perelman and the Poincaré conjecture, Riemann hypothesis, Goldbach conjecture, twin-prime conjecture,


G. Lejeune Dirichlet


L.E.J. Brouwer


E. Bishop

Mandelbrot and fractals, the P/NP problem, and of course Wiles and his proof of Fermat's last theorem. This highlights again the problem of what is considered to be a proof. How about a proof by a computer? And what about proofs that are so long, deep and broad that no one referee will ever be able to confirm that the proof is completely correct?



G. Mittag-Leffler

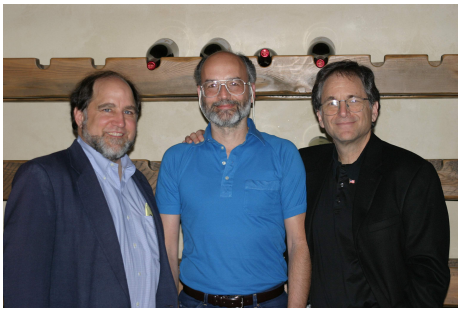
Alternatives for this book are for example [1, 2, 3, 4].

This is is one of the many books that Krantz has written (somewhere between 70 and 80 by now). It is addressing a reader that is generally mathematically interested. The most difficult and involving mathematical details themselves are avoided, but nevertheless, mathematics are definitely there and thus I believe that it will be mainly of interest to mathematicians. Some mathematical concepts are included as short inserts. On the other hand it is not only mathematics and there are remarkably few formulas. There are extensive historical parts with anecdotes. You can learn for example why there is no Nobel prize for mathematics. And it is not because a mathematician ran off with his wife as the wild story goes among mathematicians. The true reason, according to Kranz, is that Nobel was a solitary bachelor who was jealous of his mathematical compatriot Mittag-Leffler was a very exuberant and popular womanizer (he probably had an affair with Sonya Kovalevskaya). So probably Nobel did not create a prize for mathematics because the chance was high that Mittag-Leffler would get it.

The second book was co-authored by Steven Krantz and Harold Parks. Here the idea is to tell some of the success stories of mathematics since the 20th century. Fourteen cases are mentioned. Among these, we find the usual suspects, several of them also featured in the first book: the four colour problem (Apple & Haken 1976), mathematical finance with the Black-Scholes equation (1973), special relativity (Einstein 1905), RSA encryption (Rivest, Shamir and Adleman 1977), the P/NP problem, and Wiles proof of Fermat's last theorem (1995).

Black & Scholes

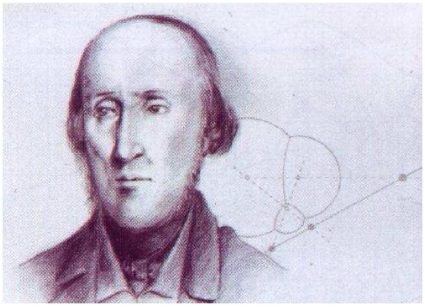
AKS



RSA (in 2003)

Also Perelman's adventures (1994) and his proof of Poincaré's conjecture is a well known story that has nearly obtained the status of a dramatic sitcom. Another topic is dynamical systems which is a pretext to review Mandelbrot sets (a 3D version is on the cover), the Lorenz attractor and other chaotic phenomena.

Wavelet theory is a marvelous example of how theoretical physics, signal processing, and harmonic analysis collaborated to boost this subject. As a result, it had an immediate impact on the applications which is rather unusual for mathematical theories. Minimal surfaces are approximated by soap films and bubbles, an observation by the Belgian physicist J. Plateau (1801-1883) and the problem was named after him. A proof was only given by J.E. Taylor in 1976. The Agrawal–Kayal–Saxena primality (AKS) test published in 2002 places this problem in the complexity class P.



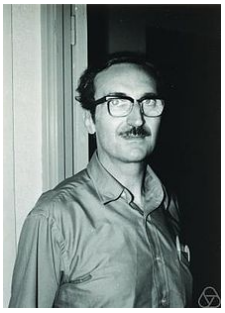
Joseph Plateau

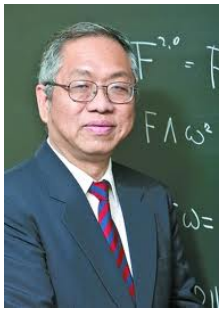
The introduction of non-Euclidean geometry by J. Bolyai and N. Lobachevsky unchained vivid exploration of what had been a taboo for centuries. Riemannian geometry allowed Einstein to

derive his relativity theory and nowadays Calabi-Yau manifolds are in the toolbox of theoretical physicists unraveling the tiniest building blocks of the physical reality. The chapter on Gödel's incompleteness theorem is rather extensive discussing formal axiomatic systems and computer generated proofs.


Janos Bolyai


Nikolai Lobachevski


Eugenio Calabi


Shing-Tung Yau

The chapters can be read independently. They differ a bit in style and extent. Some start with an extensive discussion of the early history. Others are rather short. Also the level of mathematical knowledge that is assumed differs. It is obviously intended to be accessible for a general readership, but I think that some chapters require from the reader a strong interest in the subject to keep on reading, if he or she is not mathematically trained. Every chapter ends with a section "A Look Back". Also that varies in length and content. Sometimes it is a kind of summary of the chapter, sometimes it gives additional or historical information. There are of course the recognizable characteristics of previous books by Krantz: the anecdotes, gossip, and inside stories about the main players and events. It should certainly give an idea to non-mathematicians, what keeps mathematicians busy all day, and why it is important that they do what they do.

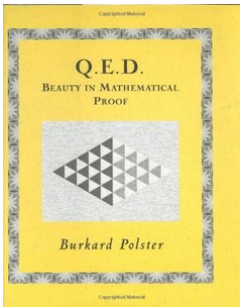
References

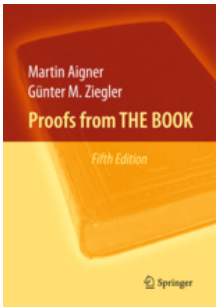
[1] Burkard Polster *Q.E.D.: Beauty in Mathematical Proof*. Wooden Books Ltd, 2006.
This is a short, nicely illustrated book with mainly visually oriented proofs. A new edition appeared in 2014. 2

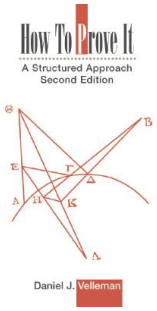
[2] Aigner, Martin & Ziegler, Günter *Proofs from THE BOOK*. Springer Verlag, 1998.
This well known book had updated editions in 2002, 2004, 2006, 2014. 2

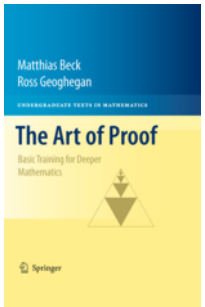
[3] Daniel J. Velleman *How to Prove It A Structured Approach*. Cambridge U. Press, 1994.
This explains how to break down a proof in elementary steps. (2nd ed. in 2006). 2

[4] Matthias Beck & Ross Geoghegan *The Art of Proof*. Springer Verlag, 2010.
A book to introduce undergraduates to methods for mathematical proofs. 2



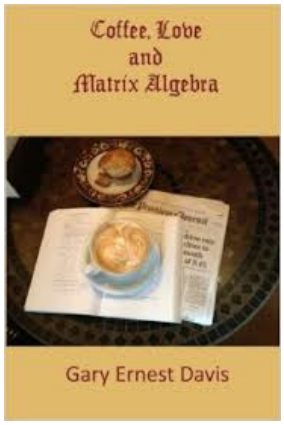






Adhemar Bultheel

Coffee, Love and Matrix Algebra *Gary Ernest Davis* Republic of Mathematics, 2014, ISSN 978-0-692262306, 389 pp.



Gary Ernest Davis

The mission of *The Republic of Mathematics*is to help teachers and students of mathematics. Mathematics should be joyful and should engage people to collaborate. This is a novel that grew out of a daily blog maintained by the author. Gary Davis, professor of mathematics at the University of Massachusetts Dartmouth is involved in an NSF project for stimulating computational mathematics in undergraduate courses in science and engineering.

The previous elements are all reflected in the novel. It consists of 77 chapters of about 4-5 pages each. It describes the day-to-day life in a fictional mathematics department. We find all the archetypes of mathematicians taking up a role in the story. And with archetype, I do not mean the typical autistic out-of-this-world strange weirdo that outsiders may have, but the real life mathematicians that any academic mathematician will have known sometime somewhere. Recognizing the idiosyncracies of the characters make you chuckle now and then. But the aftertaste that remains when you finish reading is that Davis is expressing some of his preferences and ideas that are also the ideas of *The Republic of Mathematics*.

The story is about a older professor Jeffrey Albacete whose successful *Matrix Algebra* book, 9th edition is just out. He is used to work on his own and is cocooning in the success of his book, and defending his territory like a watch dog. He is addicted to coffee and muffins. When an open position comes available, he is trying to nominate someone from his domain: Heinrich Zimmer. Almost all the other staff members are in favor of Boa Zhang, a young female who is more computationally oriented. The department chair is not taking the lead. He has taken up this position just to avoid any other duties. In the end both candidates are employed. Albacete, in his beloved coffee shop, learns from a grad student Lisa Da Silva about the possibility of Mathematica to write a book with interactive pieces: the Computational Document Format that makes the mathematics alive 'like in a Harry Potter book'. Lisa, who turns out to be a better coffee aficionado than Jeffrey, is engaged to transform the algebra book into the CFD format. Moreover applications are added by Heinrich and they both become coauthors. These and other changes strike Jeffrey like lightning, but which he starts enjoying after a while.

When the department chair has an accident and is out for several months, a younger staff member becomes the chair, much to the dislikes of inactive older members. Much more is going on, most of all the dynamics of the younger and new staff members initiate many new, more computational and interdisciplinary collaboration, even involving secondary schools and students from engineering.

It is all a bit too optimistic and has the typical American feel of the-sky-is-the-limit and all the puzzle pieces fall too easily into place. When near the end even love and pregnancy is dropped into the story, the topping becomes a bit too sweet to swallow. The first half is fun to read but when Davis starts promoting *The Republic of Mathematics* credo, it becomes somewhat boring.

The characters tough are rather convincing and even real existing mathematicians like Gill Strang, Gene Golub and Nick Trefethen appear. Another regrettable feature is that there are several typos, at least more than usual in a novel, and there is an unexplainable blank page 93. There is a lot of modern technology like Mathematica with CDF, MATLAB, Dropbox, etc., but it seems to suggest that these are the only ones, but these are of course not the only ones of their kind. So I expect this to be somewhat restricted to Gary Davis's own experience. A. Bultheel

Facets of Quantum Homogeneous Spaces

3 – 4 December 2015
VUB, Pleinlaan 2
Brussels – Belgium

Speakers:

Y. Arano
P. Bieliavsky
F. Bonechi
S. Kolb
S. Launois
A. Mudrov
S. Neshveyev
R. Ó Buachalla
J. Stokman
M. Van den Bergh (*)

(* to be confirmed)

Organized by: K. De Commer
http://homepages.vub.ac.be/~kdecomme/Workshop.html

Research Foundation Flanders
Opening new horizons

Vrije Universiteit Brussel

Wavelets and Applications

Tuesday, 15th December 2015

Institute of Mathematics, ULg

Alain Arneodo	*Wavelet-based multifractal analysis of dynamic infrared thermograms and X-ray mammograms to assist in early breast cancer diagnosis*
Bruno Torresani	*Wavelet analysis of deformed stationary processes, applications to non-statrionary sound analysis*
Béatrice Vedel	*Hyperbolic wavelets and anisotropy*

Université de Liège

With financial support of

FNRS

IMAGINARY

wiskunde in sprankelende beelden

Citrus $x^2+z^2 = y^3(1-y)^3$

Gent, Campus Sterre, Gebouw S30,
28 september t.e.m. 23 oktober 2015

Leuven, Centrale Bibliotheek,
7 november t.e.m. 28 november 2015

Kortrijk, Kulak, 4 januari t.e.m. 22 januari 2016

Antwerpen, Campus Middelheim,
1 februari t.e.m. 19 februari 2016

Diepenbeek, Agoralaan, gebouw D,
29 februari t.e.m. 18 maart 2016

Brussel, Pleinlaan 2, 11 april t.e.m. 29 april 2016

Een reizende wiskundetentoonstelling, voor het eerst in België.
De schitterende beelden, unieke 3D-objecten en interactieve visualisaties laten niemand onberoerd.

GRATIS TE BEZOEKEN.

Volg ons aanbod voor leraren, scholen en gratis geleide bezoeken op **www.imaginarymaths.be**

EEN INITIATIEF VAN VLAAMSE WISKUNDE OLYMPIADE I.S.M. DE VLAAMSE UNIVERSITEITEN

ORGANISATOREN

PARTNERS

V.U. Paul Igodt voor Vlaamse Wiskunde Olympiade vzw - Visualisatie: Herwig Hauser

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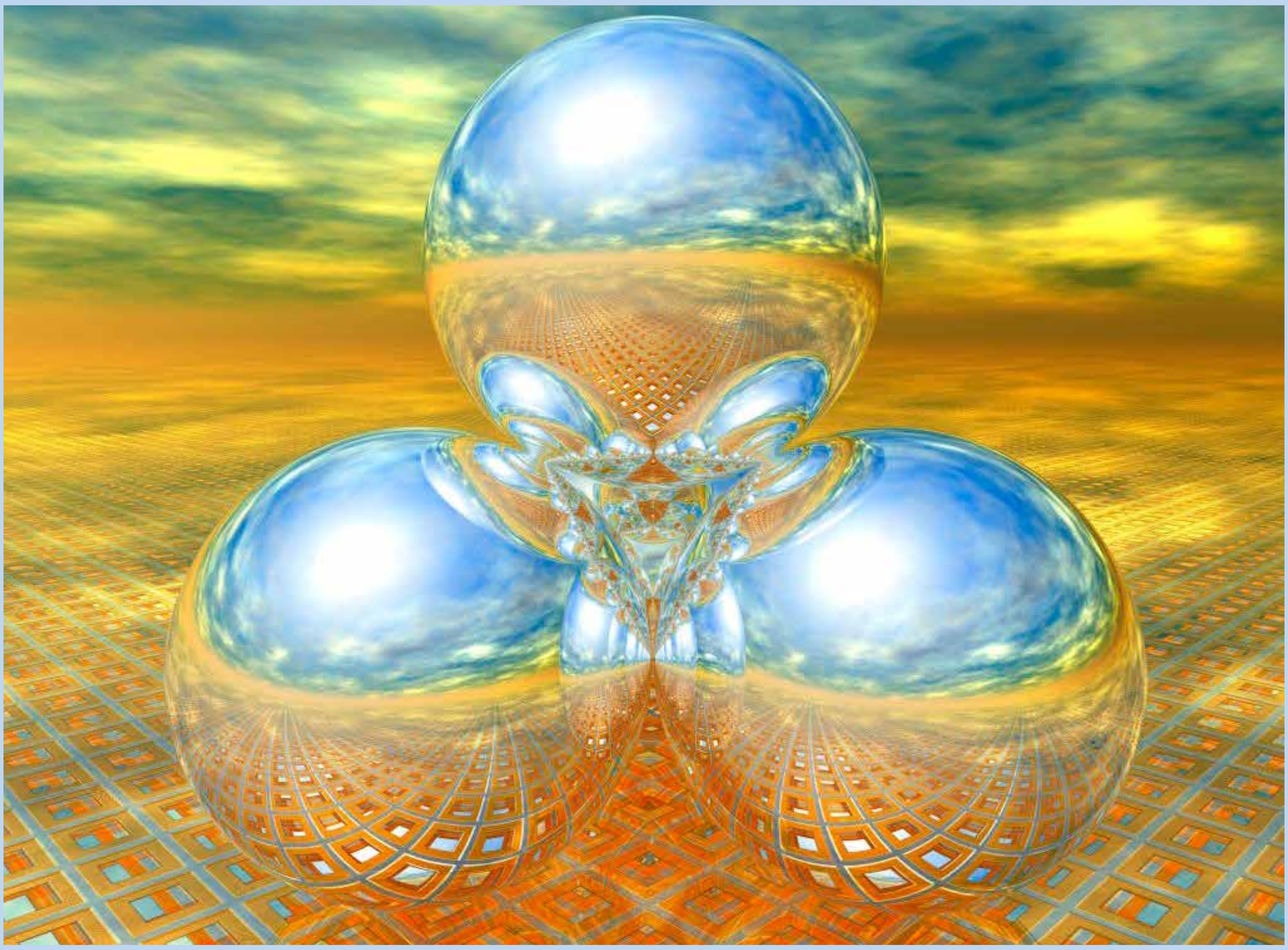
wiskunde in sprankelende beelden



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Kortrijk, Kulak, 4 januari t.e.m. 22 januari 2016

Antwerpen, Campus Middelheim,
1 februari t.e.m. 19 februari 2016

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ORGANISATOREN

PARTNERS

V.U. Paul Igodt voor Vlaamse Wiskunde Olympiade vzw - Foto: Luc Benard