

BELGIAN MATHEMATICAL SOCIETY

Comité National de Mathématique CNM



NCW Nationaal Comité voor Wiskunde

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

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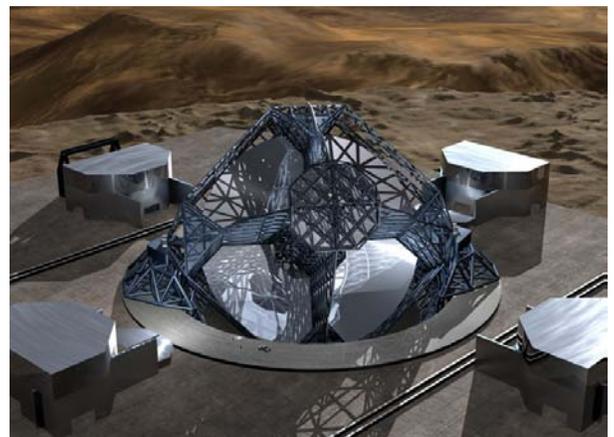
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The Hourglass Nebula
(NGC 6946 - PONS 2)



BMS-NCM NEWS

No 54, September 15, 2005

Letter from the editor

Welcome to the September 15-Issue of our Newsletter!

Some days ago, you should have received the electronic version of the special Issue of the Newsletter dedicated to the first

PhD-Day

organized by the BMS. This meeting encountered a

very great success,

with 80 participants and very interesting lectures and posters.

Congratulations to all the PhD students!

In this Newsletter, you can also find informations about the

awards

offered on this occasion.

On the occasion of this Meeting, 22 participants joined us as new members of the BMS. Welcome! They are immediately included in the email database for receiving the Newsletters...

*Have a nice fall semester,
Françoise Bastin*

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1 News from the BMS

On the occasion of the general Assembly, May 21, 2005, the new Committee of the BMS was elected (September 2005–August 2008). The composition is the following:

Catherine Finet (UMH), President

Stefaan Caenepeel (VUB), Vice-President

Jan van Casteren (UA), Secretary

Guy Van Steen (UA), treasurer

Hendrik Van Maldeghem (RUG), Editor in Chief of the Bulletin

Yves Félix (UCL), Book review Editor

Françoise Bastin (ULg), Editor of the BMS-NCM Newsletter

Pierre Bielavisky (UCL), Adhemar Bultheel (KUL), Philippe Cara (VUB), Eva Colebunders (VUB), Camille

Debiève (UCL), Freddy Dumortier (LUC), Paul Godin (ULB), Albert Hoogewijs (RUG), Pierre Lecomte (ULg),

Christian Michaux (UMH), Philippe Toint (FUNDP), Michel Van den Bergh (LUC), Lieven Vanhecke (KUL),

Marc Willem (UCL).

Here follows the farewell speech of the President, Adhemar Bultheel.

Ghent, May 21, 2005

Dear brothers and sisters in mathematics,

Charles Darwin once said: “A mathematician is a blind man in a dark room looking for a black cat which isn’t there”. So I was wondering how he would define a president of a mathematical society. Anyway, when I was elected as the president of the BMS, on May 27, 2002, I felt like a blind cat which wasn’t even there. But all of a sudden I realized that I was a president, and I was probably supposed to give a speech, which I hadn’t prepared. So it consisted of a short “thank you” and a request for help and support.

Now, at the end of the three years, I did prepare a speech.

First of all, I learned that being president is not hard at all if one is supported by a great team, such as I had. It was a challenge since Jules Leroy had left, and Jan Van Casteren had to take over a formidable task of being secretary. But we had other replacements in the committee shortly before and shortly after my election: Françoise Bastin, Hendrik Van Maldeghem, Pierre Bielavisky, Philippe Cara, Camille Debiève. They were very active and enthusiastic members of the committee, and they still are. As a short person, I like this quote from Isaac Newton: “If I could see farther, it is only because I could stand on the shoulders of giants”. I could paraphrase this and say that I could only be president because I was supported by this great team of collaborators.

So let me go over the achievements of some members of the committee and you will realize that a president was hardly needed. This list is not exhaustive and you should consider these as some examples. All members of the board are essential for the functioning of the BMS. Let me go over some of the names in alphabetical order.

So I start with Françoise Bastin. She has made the newsletter go digital and gave it a complete new look and content, which in my opinion is both informative and pleasant to read. It has been mailed electronically to our members and it can be downloaded from the the BMS web site. Therefore she became the person who knows best about movements of our members because her email address-book is permanently updated.

As long as I am a member of the committee, Stefaan Caenepeel has taken care of the financial situation of the BMS. And he has done an excellent job. The financial situation of the society is healthy. A not so obvious achievement, given the fact that payments of members, libraries, and reciprocity agreements come in with sometimes the most impossible information that is often incomplete. And yet, he can be offered the Santa Claus job of the BMS. He can take each of our members on his knee and ask whether they payed their yearly dues, and they wouldn’t dare to lie because it is all in his thick books.

Philippe Cara became our webmaster. He has produced a web page that is designed with modern information technology, and gave it a much nicer look. He is keeping it up to date. In a so quickly changing world as information technology, maintenance is a big issue. The Bulletin, the Newsletter, jobs, and other announcements, registration forms, address labeling, etc., it all needs regular updating. He also could provide an electronic solution for the back issues of the Bulletin that were out of print and therefore not mailed to some libraries, asking for them. Password or IP-address based limited access to the full text is made possible with a cdrom as an alternative. But even more interesting and rewarding is all the work he has put into the design of a database. Since the work of Jules Leroy had been split up in several tasks that were taken care of by different persons, a central database was needed. That is now operational and a joint effort of Stefaan Caenepeel, Françoise Bastin and Philippe Cara made the information of our list of members up to date. Everybody can check on the BMS web site whether somebody is indeed a member, if that person has agreed to make that information available.

It can be used to produce address labels for mailing by the secretary or anybody else who has access to that restricted information. It will be a challenge to make also the information up to date about the exchanges and the libraries that subscribed to the Bulletin.

Since the new format of the Bulletin started in 1994, Camille Debiève is the managing editor. If you ever tried to deal with electronic versions of papers compiled by different people to fit them into a uniform style, then you can appreciate the work that he has to put into that. Moreover, since it had been decided in 2003 that the Bulletin would be included in the project Euclid at Cornell University, he also has to provide the meta information so that they can put it on their servers. Meanwhile the first revenues from the project Euclid have been transferred to the BMS, and the people from Euclid themselves have adapted the electronic version of our journal for the period from 1994 on, so that the new Bulletin is on-line since its volume 1 in 1994 and all volumes older than 5 years are freely available.

The former editor in chief of the Bulletin, Yves Félix, is now doing an excellent job as the book review editor of the Bulletin. In fact there are so many book reviews for the moment that we even have a backlog for the reviews. So a solution for that problem has to be found too. But creative as he is in finding solutions, I consider the problem as being solved.

I am approaching the end of the alphabet, so I come to Jan Van Casteren. He had one of the toughest jobs in the BMS. The secretary has indeed a key position. He is the one initiating the committee meetings, by sending around a reminder and an agenda, we see him at work during the meeting taking notes, and he prepares the minutes for the next meeting. But that is only a couple of times per year. The secretary has to process all the letters from members, from publishers, from other societies, from libraries, and so on and so further. And even if Jules Leroy had everything well organized, if you have to drop in, it is basically starting from scratch. Believe me, it is a hell of a job, but Jan is working through this bombardment like Columbus once sailed the waves. Thank you Jan.

Finally, there is Hendrik Van Maldeghem. He does about everything else that is organized by the BMS. He is the editor in chief of our Bulletin and is doing a great job in reducing our backlog, and pushing up the quality of the papers. It is also under his guidance that our Bulletin became part of the project Euclid, which I think was a very wise and lucrative decision. Besides of this, he was also the BMS contact person for the Dutch-Belgian Mathematical Congress, in Tilburg, April 2004, and he is the main organizer of the BeNeLuxFra Mathematical Conference here in Ghent, May 2005. It can not be overestimated what time it costs, even if there is a well organized army of PhD students to help, one has to set up hundreds of things that one can think of, and solve the thousands of other things that one didn't think of.

Hendrik, and several others were also actively participating in other BMS subcommittees to work out some other problems, like the MAC (Member Alert Committee) which came up with several initiatives: making contact with the teacher's organizations (we had an announcement placed in their magazines, and they wrote something up for our Newsletter), the poster action, the PhD Day that is planned for September of this year in Brussels, etc.

The BMS was also intensifying its contact with other organizations. We still have reciprocity agreements with other national mathematical societies. Also the BMS upgraded from a class 3 to a class 2 member of the EMS, something that had been decided already under the previous BMS president J. Schmets, but which became official at the June meeting of the EMS in 2002. We had a history of the Societies that participate in this BeNeLuxFra conference published in each others newsletters. The BMS also took part in the applications for several European projects for digitalization of mathematical literature. Unfortunately these were not successful. The BMS also supported the Belgian membership to ERCIM (European Research Consortium for Informatics and Mathematics). Which became true: the FNRS and FWO represent Belgium in this organization.

Within Belgium, the BMS continued to sponsor the Mathematics Olympiad organizations, and the collaboration with the national Committee of Mathematics has been tightened. The president of the BMS will be invited at the meetings of the NCM, but there has also been a series of joint actions that were undertaken. In 2002, The BMS took the initiative to bring the persons together who were responsible for the curricula of mathematics education at the different universities to discuss the strategy to be followed for the implementation of the Bachelor/Master structure as a consequence of the Bologna declaration. At the same time, the BMS and the NCM wrote a letter to all the responsible instances pleading for a 3+2 constellation.

In 2003 a similar letter was jointly signed by BMS and NCM presidents, and mailed to all the responsible instances concerning the viewpoints of these organizations on the use of the Science Citation Index and Impact Factors to evaluate research in mathematics.

Later that year we had a joint venture in the organization of a colloquium on Mathematics and Genomics, of which the proceedings appeared just recently. I mention the lecture of Michel Van den Bergh (winner of the 2003 Francqui prize) at the Academy in 2004.

And there are numerous other activities where the BMS members were directly or indirectly involved: the

Solvay meeting dedicated to Henri Poincaré, October 2004; the meeting of the Abel committee in February 2005, the Mathematics quo vadis? colloquium in April 2005, etc.

As you can see, if you have a team like this, it is not at all hard to be a president. Let this be a relieve for my successor.

It is now time to reveal the new team which is much the same as the team we had before, with some changes in the function and some new names. Two members have disappeared from the list: Fred Van Oystaeyen and Jean Schmets. They both have worked hard for the BMS in organizing conferences, even being president. I want to thank them for an almost lifelong dedication to the BMS.

Here is the new list which I want to present to the general assembly for approval.

BMS Committee 2005-2008	
Catherine Finet (UMH)	President
Stefaan Caenepeel (VUB)	Vice-President
Jan Van Casteren (U. Antwerpen)	Secretary
Guido Van Steen (U. Antwerpen)	Treasurer
Françoise Bastin (ULg)	Editor BMS-NCM News
Pierre Bieliavsky (ULB)	
Adhemar Bultheel (K.U.Leuven)	
Philippe Cara (VUB)	Webmaster
Eva Colebunders (VUB)	
Camille Debiève (UCL)	Managing editor Bulletin
Freddy Dumortier (LUC)	
Yves Félix (UCL)	Book review editor
Paul Godin (ULB)	
Albert Hoogewijs (U. Gent)	
Pierre Lecomte (ULg)	
Christian Michaux (UMH)	
Philippe Toint (FUNDP)	
Michel Van den Bergh (LUC)	
Lieven Vanhecke (K.U.Leuven)	
Hendrik Van Maldeghem (U. Gent)	Editor in chief Bulletin
Marc Willem (UCL)	

Thank you for your attention.

*Adhemar Bultheel
ex-president BMS*

2 News from the NCM

The next Meeting of the NCM is scheduled on **October 19, 2005**, at the Academy, Brussels. It will take place after the lecture

*Professor Hendrik Van Maldeghem (RUG)
Buildings and Groups: A simple marriage of Lie type
October 19, 2005, 14:30, in the buildings of the Academy*

3 News from the PhD-Day

Three awards were offered, for the three best posters (they are included at the end of this Newsletter). The winners are (alphabetical order)

- **Bougard Nicolas**, ULB; prize: a book offered by Springer, untitled “The book of proofs”
- **De Schepper Nele**, UGent; prize: a gift offered by Arabesk
- **De Wispelaere An**, Ugent; prize: a “good for 25EUR” in the VUB Press catalog

Congratulations!

4 Meetings, Conferences, Lectures

4.1 September 2005

EMS-SCM Joint Mathematical Week-end
September 16-18, 2005
 Barcelona, Spain

This meeting is organised by the Catalan Mathematical Society, under the auspices of the EMS. Informations: <http://www.iecat.net/scm/emswweekend>

Topics and plenary speakers

- Combinatorics and Graph Theory, Béla Bollobás (Trinity College, Cambridge and University of Memphis)
- Dynamical Systems, Jean-Christophe Yoccoz (Collège de France)
- Evolution PDEs and Calculus of Variations, Henri Berestycki (Ecole des Hautes Etudes en Sc. Soc., France)
- Module Theory and Representations of Algebras, Henning Krause (Universität Paderborn)
- Non-commutative Geometry, Alexey I. Bondal (Steklov Mathematical Institute, Moscow)

Organizing Committee

Marta Sanz-Solé (Chair), Universitat de Barcelona
 Jaume Amorós, Universitat Politècnica de Catalunya
 José A. Carrillo de la Plata, ICREA-Universitat Autònoma de Barcelona
 Carles Casacuberta, Universitat de Barcelona Dolors Herbera
 Universitat Autònoma de Barcelona Teresa Martínez-Seara
 Universitat Politècnica de Catalunya Rosa Maria Miró-Roig
 Universitat de Barcelona Marc Noy
 Universitat Politècnica de Catalunya

Session co-organizers

Lidia Angeleri-Hügel (Università degli Studi dell'Insubria)
 Xavier Cabré (ICREA- Universitat Politècnica de Catalunya)
 Peter Cameron (Queen Mary, University of London)
 Arnfinn Laudal (University of Oslo)
 David Sauzin (CNRS, France)
 Giuseppe Toscani (Università di Pavia)

Address: Facultat de Matemàtiques, Universitat de Barcelona, Gran Via 585, E-08007 Barcelona
<http://orfeu.mat.ub.es>, phone: 34-934021655, fax: 34-934021601

ESF Research Conference on
Geometric Representation and Invariant Theory Algebraic Quantization and Deformations

Spa, Belgium, 16-21 September 2005

Chair: Fred Van Oystaeyen (University of Antwerp, BE)

Invited Speakers will include (list to be completed):

M. Brion (Grenoble Univ., FR); A. Joseph (Weizmann Institute, IL); L. Kauffman (UIC Chicago, US); B. Keller (Paris VII University, FR); P. Littelmann (Wuppertal Univ., DE); L. Le Bruyn (Antwerp Univ., BE); C. Menini (Ferrara Univ., IT); M. Nazarov (York Univ., UK); C. Procesi (Rome Univ., IT); M. Reineke (Münster Univ., DE); A. Rudakov (NTNU Gloeshaugen, NO); S. Silvestrov (Lund Univ. NO); A. Szenes (Budapest Univ. HU); M. Van den Bergh (Hasselt Univ. BE).

Scope: Recent developments in Noncommutative Algebra and Noncommutative Geometry will be discussed at this meeting. Particular areas of interest will be: interaction between Representation Theory, Algebraic Geometry, Invariant Theory, Quantum Group Theory etc... with application to Physics or effective computations. The emphasis will be on new emerging theories and applications, e.g. the geometry of path algebras and quiver varieties; the study of asymptotics of representations; quantization and deformation theory; geometric interpretations of the standard monomial basis for path theory and relations to crystal constructions; graded character theory in the O-category for semisimple Lie algebras; quantum invariants of maps between manifolds and problems concerning crossed braided categories; quiver-module and their cohomology in relation to the representation theory of Borchers algebras, etc. The general philosophy is to support the blending at a deeper level of noncommutative algebra with geometric and topological methods.

Contact person at the ESF: Mr. Rachid Adghoughi, Conference Organiser (radghoughi@esf.org)

4.2 October, 2005

BUILDINGS, GROUPS and ALGEBRAS Ghent, 14 and 15 October 2005

On the occasion of the **75th birthday of Jacques Tits** we organize a conference in Gent. This conference will start on Friday, October 14 in the afternoon, and end in the early afternoon on Saturday, October 15. Each day there will be three one-hour lectures. We are happy that the following speakers agreed to give a talk:

- Pierre-Emmanuel Caprace (Bruxelles)
- Tom De Medts (Gent)
- Gopal Prasad (Ann Arbor)
- Bertrand Remy (Lyon)
- Jean-Pierre Serre (Paris)
- Richard Weiss (Boston)

There will be no registration fee. A conference dinner will be organized on Friday evening.

If you want to receive the second announcement (beginning of July) with more details about the programme, accommodation, travel information, etc., please send an email to

bmuehlherr@ulb.ac.be

You may also wish to visit the homepage of the conference, which is <http://cage.rug.ac.be/hvm/conference.html> and which will be updated from time to time.

The organizers,
Bernhard Muehlherr & Hendrik Van Maldeghem

October 19, 2005, 14:30, Academy, Brussels Lecture of Professor H. Van Maldeghem

The next Meeting of the NCM is scheduled on October 19, 2005 at the Academy, Brussels. On this occasion,

Professor Hendrik Van Maldeghem (RUG)

will deliver a talk untitled

Buildings and Groups: A simple marriage of Lie type.

Everyone is welcome.

4.3 November, 2005

Mathematical Analysis Day November 10, 2005 Ghent University

At the occasion of his retirement and his 65th birthday, the Clifford Research Group of Ghent University will honour its founder Richard Delanghe by a one day symposium "Mathematical Analysis Day".

Date: Thursday the 10th of November, 2005

Venue: "Het Pand", Onderbergen, 9000 Gent

Speakers: Christiane Carton-Lebrun, Simone Gutt, Jean Schmets, Walter Van Assche, Jan Van Casteren, Frank Sommen

Welcome coffee at 09:30, Lunch at 13:00, Closing reception at 17:00

You are all cordially invited to attending (free of charge). Please register by sending an email to nds@cage.ugent.be with subject line: MAD-registration

The organizers
Fred Brackx, Hennie De Schepper, Frank Sommen
Ghent University, Department Mathematical Analysis
Clifford Research Group
Galglaan 2, B-9000 Gent, Belgium

4.4 2006

55th European Study Group Mathematics with Industry (SWI2006), Eindhoven.

The 55th European Study Group Mathematics with Industry (ESGI55 or SWI2006) will be held at the Technische Universiteit Eindhoven from January 30 to February 3, 2006. We would like to invite you to participate.

For more than thirty years, the Study Group Mathematics with Industry has brought together mathematicians and companies. Following the original Oxford model, about 60 mathematicians, ranging from PhD students to professors, spend a week working on one of the six real life problems, presented to them on Monday morning. During four busy days these problems are discussed, dissected, modelled, analysed, and computed through, and results are presented on Friday. We are still in the process of selecting the problems; please consult the website for details. We anticipate that a wide range of mathematical expertise is needed to contribute to solving these problems. This includes differential equations, numerical analysis, probability theory, statistics, graph theory, optimisation and much more.

Examples of problems from the past years include:

- the behaviour of a droplet of polymer solution in an ink-jet printer (Philips);
- quality forecasting of flight schedules (KLM);
- the diffusion of euro coins in the euro zone.

If you enjoy applying your mathematical skills to problems from the world outside academia, please visit the website for more information and register at: <http://www.win.tue.nl/swi2006/>

Participation is free. Limited funding is available to cover hotel costs.

We hope to see you at the study group in Eindhoven,
the organising committee.

(Erik Fledderus, Remco van der Hofstad, Ellen Jochemsz, Jaap Molenaar, Tim Mussche, Mark Peletier and Georg Prokert.)

**CANT'2006 International School and Conference
on Combinatorics, Automata and Number Theory**
Belgium, University of Liège, Department of Mathematics
May 8-19, 2006

Aim:

The proposed international school is aimed at presenting and developing recent trends in Combinatorics (with emphasis on Combinatorics on Words), Automata Theory and Number Theory. On the one hand, the newest results in these areas shall benefit from a synthetic exposition, and on the other hand, emphasis on the connections existing between the main topics of the school will be sought. Concurrently to the school, there will be an international conference focusing on the same topics. Courses and lectures will be organized in the morning, while the afternoon sessions will be devoted to the conference.

Main Invited Speakers:

J.-P. Allouche (CNRS, Univ. Paris-Sud), Y. Bugeaud (Univ. of Strasbourg), F. Durand (Univ. of Picardie, Amiens), P. Grabner (Techn. Univ. of Graz), J. Karhumäki (Turku Univ.), H. Prodinger (Univ. of Stellenbosch), J. Sakarovitch (CNRS, ENS Télécom.), J. Shallit (Univ. of Waterloo), B. Solomyak (Univ. of Washington), W. Thomas (RWTH Aachen).

Format:

Five invited lecturers per week. Participants can decide to attend to one of the two weeks of this event. Talks will be selected on the basis of an extended abstract (max. 6 pages). Deadline for the submission of abstracts: April 1st, 2006. More details will be available in due time on the conference web site.

Organising Committee: V. Berthé (CNRS, Montpellier), M. Rigo, P. Lecomte (Liège).

Location: Institute of Mathematics, University of Liège, Belgium.

Information: e-mail: M.Rigo@ulg.ac.be

Web site: <http://www.cant2006.ulg.ac.be>

5 Summary of PhD theses

Deformation theory and Hochschild cohomology of abelian categories

Wendy Lowen

May, 2005, VUB

You will find the abstract at the end of this Newsletter.

Comatrix corings applied to weak and partial Galois theory

Erwin De Groot

September 23, 2005, VUB

Supervisor: Stefaan Caenepeel

Corings can be viewed as coalgebras over noncommutative rings, in fact they are coalgebras in the monoidal category of bimodules over a (non-commutative) ring. A beautiful and important application of corings is an elegant reformulation of descent and Galois theory. We have developed descent and Galois theory over comatrix corings, that generalize the Sweedler canonical coring. We apply this in two particular situations: we first discuss Galois theory of weak Hopf algebras, generalizing Chase and Sweedler's Galois theory for classical Hopf algebras. A tool that is introduced first is the notion of weak entwining structures. The second application concerns partial actions by groups; in the case where the actions are defined everywhere, we recover the classical Galois theory over commutative rings. We have also discussed a class of infinite comatrix corings, that can be constructed as colimits of finite comatrix corings. In the final chapter, we introduce Frobenius functors of the second kind, and give some applications.

6 Miscellaneous

6.1 From VUB

6.1.1 Visitors

Professor Ingrid Daubechies (Princeton)

will be visiting the department of mathematics from October 28 till November 6, 2005.

On *October 29, there will be a colloquium on Applied Mathematics*. For more information, contact Philippe Cara (pcara@vub.ac.be).

Professor C. Praeger (University of Western Australia)

will be visiting the department of mathematics from November 7 till November 18, 2005. For more information, contact Philippe Cara (pcara@vub.ac.be).

6.1.2 Position

The Faculty of Sciences of the Vrije Universiteit Brussels invites applications for a

Full-time Academic Position in Statistics(WE/2005/010)

The vacancy concerns a tenure-track position in the Department of Mathematics.

Tasks

- Teaching: in the Bachelor and Master program of the Department of Mathematics (especially for the specialization "stochastics/financial mathematics") and possibly some service teaching for other departments and faculties. The candidate should be an excellent teacher. He/she would also supervise projects in the bachelor program and direct theses in the master program of mathematics.

- **Research:** The research area of the candidate should be STATISTICS with a proven record of excellence in one of the following areas: applied statistics, stochastic processes and applications, (actuarial) risk theory, financial mathematics and applications. Strong candidates in related areas also might be considered.
- **Other tasks:** It is expected that the candidate further strengthens the co-operation with other Departments of the University and that he/she substantially contributes to the Master specialization "stochastics/financial mathematics". An interest in actuarial sciences is a plus. The candidate will actively participate in all aspects of the Ph.D. program of the Department. The candidate should also attract external funding for research projects.

Teaching languages are Dutch and English. Non-Dutch speaking candidates are encouraged to apply as well; a training period may be considered for such candidates.

Starting date: October 1, 2005 or later depending on the constraints of the candidate. Candidates should apply within **1 month** after publication of this vacancy in the Belgisch Staatsblad. (This date will be posted on the website <http://www.vub.ac.be//DWIS/>). **Diploma:** The candidate should have a Ph.D. degree in mathematics or statistics. **Contact person:** Prof. Eric Jespers, Chair, Department of Mathematics e-mail: efjesper@vub.ac.be tel. +32-2-6293493

Application procedure

Applications (including a CV, a list of publications, names of 3 referees) should be sent to the Rector, Vrije Universiteit Brussel, Pleinlaan 2, B-1050 Brussel, BELGIUM preferably with a copy or e-mail with DOC/TEX file to Ms. K. Segers, Department of Mathematics, Faculty of Sciences, Vrije Universiteit Brussel, Pleinlaan 2, B-1050 Brussel, Belgium (kasegers@vub.ac.be)

6.2 From ULB

OUVERTURE D'UN POSTE EN GEOMETRIE DIFFERENTIELLE

Moyennant l'accord des autorités, l'Université Libre de Bruxelles annoncera prochainement l'ouverture en octobre 2005 d'un poste de chargé de cours au Département de Mathématique dans le domaine de la géométrie différentielle. Les candidats sont invités à prendre contact dès maintenant avec un des membres de cette unité, en joignant leur Curriculum Vitae. Après une première sélection, certains candidats seront invités au début de l'année 2005 à faire des exposés et séjourner brièvement à l'université.

Pour plus de renseignements, ou pour annoncer votre candidature, veuillez contacter:

Frédéric Bourgeois (Frederic.Bourgeois@ulb.ac.be - +32 2 650 58 40)

Simone Gutt (sgutt@ulb.ac.be - +32 2 650 58 38), ou

Luc Lemaire (llemaire@ulb.ac.be - +32 2 213 35 46)

Université Libre de Bruxelles, Département de Mathématique
Campus Plaine CP 218, Bd du Triomphe, 1050 Bruxelles - Belgique

6.3 From ULg

Call for Nominations Prizes of the Liege Royal Society of Sciences

The Liege Royal Society of Sciences calls for nominations for prizes awarded by a foundation honouring the 150th anniversary of its foundation. These international prizes are intended for researchers less than thirty-five years of age.

Four prizes of 2,500 EUR each will reward a corpus of work published either by a single author or in collaboration. One of the four prizes, in honour of Lucien Godeaux, will be awarded in the field of mathematics.

Requests for information on how to make nominations should be directed to: Professor J. Aghion, c/o Secretariat of the Royal Society of Sciences of Liege, Institute of Mathematics of the University of Liege, 12 Grande Traverse, Sart Tilman Bat. B 37, B-4000 Liege 1, Belgium (e-mail: jaghion@ulg.ac.be).

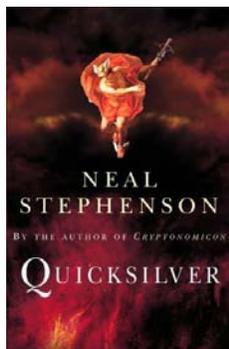
The deadline for applications is October 1st, 2005.

7 Maths and art, fiction, . . .

Neal Stephenson, *Quicksilver*

UK edition: Arrow Books, London, 2004 (927p.) ISBN 0-09-941068-0.

US edition: William Morrow, 2003, (944p.) ISBN: 0-38-097742-7

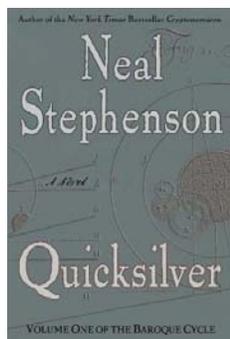


cover of UK edition

room while in Cambridge. Their story is told with much detail.

This novel was termed by one of its reviewers as 'history-of-science' fiction. When reading it, you'll meet Isaac Newton, doing all kinds of experiments, or Robert Hooke, while he is rebuilding London after the Great Fire. You'll read some (fictional) letters by Gottfried Leibniz, and you'll be able to take a look in the house of Christiaan Huygens. The novel is divided into three books (and is, as a whole, the first part of the trilogy *The Baroque Cycle*).

In book one, *Quicksilver*, we make acquaintance with Daniel Waterhouse, an Englishman staying in Massachusetts (where he has founded "The Massachusetts Bay Colony Institute of Technologickal Arts"). He is being asked to return to England to help solve the dispute between Newton and Leibniz about the priority question of the invention of calculus. Waterhouse and Newton have been friends for years, sharing a



cover of US edition

In the second book, *King of the Vagabonds*, we learn about the tribulations of Eliza, born in Qwlgm, an island off the coast of England, where she has been kidnapped to be sold as a slave, and Jack Shaftoe, a Vagabond, who rescues her, and takes her along on a trip through Europe. During their travels they happen to meet among others Gottfried Leibniz, and William of Orange.

The third book, *Odalisque*, features Daniel and Eliza. Eliza is a spy for William at the court of Louis XIV, while Daniel is in London, plotting against King James II. This part takes place at around the time of the Glorious Revolution (1688).

There isn't much of a plot to be found in the book, but the author tells an interesting story, and I'm sure that everyone who is somewhat intrigued by the history of science will derive some pleasure from reading it.

The following quote is meant to give you a taste of the style of the book.

(At this point in the story Eliza and the scientist Nicolas Fatio de Duilliers are in a sand-sailer on the beach of Scheveningen trying to catch up with William of Orange who is sailing ahead of them.)

Fatio had been raving for some minutes about the Bernoullis - Swiss mathematicians, therefore friends and colleagues of his. "Sailmakers of a hundred years ago phant'sied that sails worked as literal wind-bags, which is why ships in old pictures all have a big-bellied appearance that is very odd to our modern eyes, as if they need to be taken in. . . now we have learned that sails develop force by virtue of air-currents to either side, shaping, and shaped by, the curve of the canvas. . . but we understand not the *particulars*. . . the Bernoullis are making this their field of specialization. . . soon we'll be able to use my calculus to loft sails according to *rational* principles. . ."

The book has won the 2004 Arthur C. Clarke Award (. . . a prize normally awarded to science fiction novels).

Paul Levrie



PARTITION de Ira Hauptman

Mise en scène Jules-Henri Marchant

Avec Olivier Coyette, Christian Crahay, Pierre Dherte, Stanislas Drouart, Itsik Elbaz et Valérie Marchant

Au Théâtre du Rideau de Bruxelles du 23 septembre au 15 octobre 2005

Palais des Beaux-Arts, 23 rue Ravenstein, 1000 Bruxelles

« C'est quoi la preuve de quoi que ce soit » ? Vaste interrogation qui va hanter les nuits et les jours de Ramanujan, jeune mathématicien prodige hindou, arrivé à Cambridge en 1913 sur l'invitation de G.H. Hardy. Entre ces deux spécialistes de la théorie des nombres, le courant passe. Même si l'Anglais aux opinions affirmées ne résiste pas à la tentation d'inculquer les vertus de la preuve à celui qui dit être inspiré dans ses rêves par sa déesse familière.

Magnifique confrontation entre l'Orient intuitif et l'Occident cartésien, « Partition » de l'Américain Ira Hauptman est aussi l'histoire d'une étonnante amitié avec ses bouleversements et ses mystères. Reprise attendue de ce spectacle qui captivera tous les publics !

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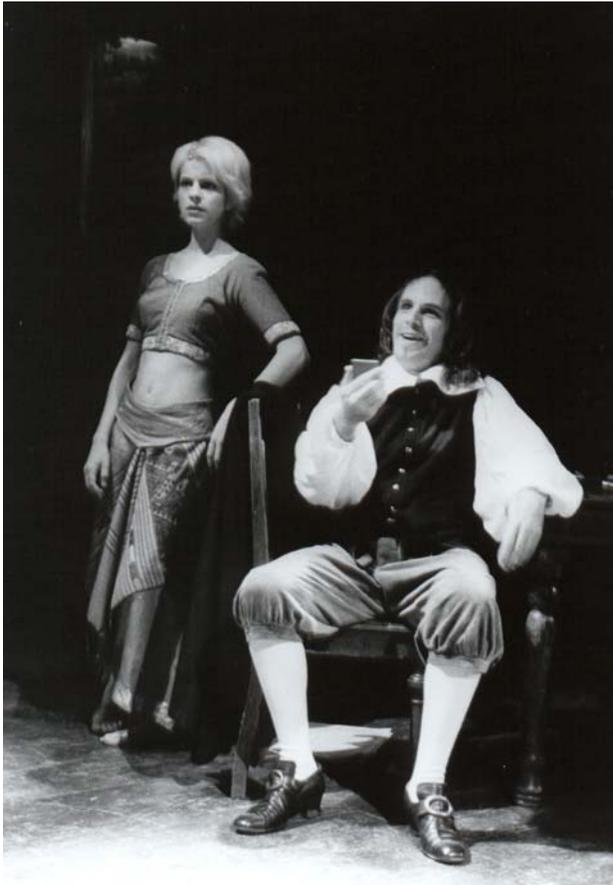
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Assistez à l'une des rencontres où Jules-Henri Marchant, metteur en scène, et Luc Lemaire, mathématicien, improvisent en scène un dialogue chaque fois différent sur les liens inattendus qui se tissent entre théâtre et mathématiques.

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Entrée libre Ces rencontres sont ouvertes à tous les publics.

Photos : Daniel Locus



**L'UER « Opération » de HEC-Ecole de Gestion de l'ULg
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L'enseignement de la statistique et des probabilités

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Léopold BRAGARD

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DEFORMATION THEORY AND HOCHSCHILD COHOMOLOGY OF ABELIAN CATEGORIES

Wendy Lowen

ABSTRACT

Het is de bedoeling met deze thesis de ontwikkeling van niet-commutatieve algebraïsche meetkunde verder te zetten. In algebraïsche meetkunde kan een geringde ruimte (X, \mathcal{O}_X) bestudeerd worden door middel van de categorie $\text{Mod}(X)$ van schoven van rechtse modulen over (X, \mathcal{O}_X) . Als X een schema is verkiest men soms de categorie $\text{Qch}(X)$ van quasi-coherente schoven (als X quasi-compact quasi-gesepareerd is) of de categorie $\text{coh}(X)$ van coherente schoven (als X noethers is). Als $X = \text{Spec}(A)$ een affien schema is over een commutatieve ring A , dan geldt $\text{Qch}(X) \cong \text{Mod}(A)$, de categorie van rechtse A -modulen en (als A noethers is) geldt $\text{coh}(X) \cong \text{mod}(A)$, de categorie van eindig gepresenteerde A -modulen. Als A nu een niet-commutatieve ring is, dan bestaat de ruimte $\text{Spec}(A)$ niet langer, maar we kunnen A nog steeds bestuderen aan de hand van de categorieën $\text{Mod}(A)$ en $\text{mod}(A)$. In niet-commutatieve meetkunde gaat men nog een stap verder. Aangezien $\text{mod}(A)$ (net als $\text{coh}(X)$) een kleine abelse categorie is, en $\text{Mod}(A)$ (net als $\text{Mod}(X)$ en $\text{Qch}(X)$) een Grothendieck categorie, denkt men aan niet-commutatieve ruimten als zijnde niets anders dan zekere abelse categorieën. Daar het niet zo evident is hoe we een willekeurige abelse categorie kunnen interpreteren als geometrisch object, is een eerste stap in de richting van het begrijpen van niet-commutatieve ruimten het bestuderen van abelse categorieën die lijken op commutatieve ruimten, bijvoorbeeld categorieën die in zekere zin deformaties zijn van $\text{Mod}(X)$, $\text{Qch}(X)$, $\text{coh}(X)$.

Het eerste doel van deze thesis is te formaliseren wat we bedoelen met een “deformatie van een abelse categorie”. Zij $S \rightarrow R$ een surjectieve ringmap tussen coherente commutatieve ringen met eindig voortgebrachte nilpotente kern I (klassiek fixeren we een lichaam k en zijn S en R lokale artinse ringen met residue lichaam k). Zij \mathcal{A} een R -lineaire abelse categorie. Per definitie is een S -deformatie van \mathcal{A} een S -lineaire abelse categorie \mathcal{B} samen met een equivalentie van \mathcal{A} met de deelcategorie \mathcal{B}_R van objecten die door I geannihileerd worden. In het algemeen kunnen we enkel die deformaties controleren waarbij \mathcal{B} bovendien *plat* is. Als \mathcal{B} genoeg injectieven heeft betekent de platheid simpelweg dat de lineaire categorie $\text{Inj}(\mathcal{B})$ van injectieven van \mathcal{B} plat is over S . Als A een R -algebra is dan komen de platte deformaties van $\text{Mod}(A)$ overeen met de (platte) deformaties van A als algebra. Het belangrijkste resultaat in dit verband is dat de abelse deformaties van \mathcal{A} (op equivalentie na) overeenkomen met de deformaties van $\text{Inj}(\text{Ind}(\mathcal{A}))$ als R -lineaire categorie (i. e. we behouden de objecten en deformereren de Hom-sets; $\text{Inj}(\text{Ind}(\mathcal{A}))$ is de categorie van injectieve objecten in de sluiting van \mathcal{A} onder gefilterde colimieten).

We ontwikkelen eveneens een theorie van Hochschild cohomologie voor abelse categorieën, welke gemotiveerd is door hun infinitesimale deformatietheorie. Uit de vorige paragraaf blijkt dat het natuurlijk is de Hochschild cohomologie $HH^*(\mathcal{A})$ van een abelse categorie \mathcal{A} te definiëren als de Hochschild cohomologie van de k -lineaire categorie $\text{Inj}(\text{Ind}(\mathcal{A}))$. Het volgt dan dat de deformatietheorie van \mathcal{A} gecontroleerd wordt door $HH^i(\mathcal{A})$ voor $i = 2, 3$. Meer precies, als we het Hochschild complex van \mathcal{A} definiëren als het Hochschild complex van $\text{Inj}(\text{Ind}(\mathcal{A}))$, dan geeft dit (in karakteristiek 0) een DG-Lie algebra die de deformatietheorie van \mathcal{A} controleert. Onze definitie van Hochschild cohomologie heeft tal van goede eigenschappen. We tonen onder andere dat als A een k -algebra is de Hochschild cohomologie van de abelse categorie $\text{Mod}(A)$ overeenkomt met die van A . Als X een noethers schema is, dan hebben de categorieën $\text{Mod}(\mathcal{O}_X)$, $\text{Qch}(X)$ and $\text{coh}(X)$ allemaal dezelfde Hochschild cohomologie. Bovendien valt deze samen met degene gedefinieerd door Swan, Gerstenhaber en Schack.

Generalized Hexagons

Definition:

A generalized hexagon is a point-line geometry the incidence graph of which has diameter 6 and girth 12.
 A finite generalized hexagon has order (s,t) if every line is incident with $s+1$ points and every point is incident with $t+1$ lines.
 For example: the lines of this poster represent a generalized hexagon of order $(1,2)$.



Faculteit Wetenschappen

An De Wispelare

Promotor: Prof. Dr. Hendrik Van Maldeghem

Definitions

The split Cayley hexagon $H(q)$ of order q , the construction of which is due to J. Tits, can be embedded into the parabolic quadric $Q(6,q)$ in such a way that the points of $H(q)$ are all the points of $Q(6,q)$ and the lines of $H(q)$ are a special subset of the lines of $Q(6,q)$.



A distance-2-ovoid of $H(q)$ is a set of points which any line intersects in exactly one point. Any point outside the set is collinear to $q+1$ of these points.

Dually, one defines a distance-2-spread.



An ovoid of $H(q)$ is a set of q^2+1 opposite points. Any point outside the set is collinear to a unique point of the set.

Dually, one defines a spread.



If O is an ovoid and S is a spread then (O,S) is an ovoid-spread pairing if every point of O is incident with a unique line of S .



A point regulus of $H(q)$ is a set of $q+1$ points, each at distance 3 from a given opposite line.

Dually, one defines a line regulus.



A two character set P in $PG(n,q)$ is a set of points s.t. every hyperplane in $PG(n,q)$ misses w_1 or w_2 points of P .



For even q , the parabolic quadric $Q(6,q)$ determines a point, called the nucleus, in which all tangent hyperplanes intersect.

The lines of any elliptic subquadric of $Q(6,q)$, which are also contained in $H(q)$, determine a Hermitian spread of $H(q)$, for every q ; if the dual object exists $H(q)$ is self-dual when $q=3$; it is called a Hermitian ovoid.
 If q is an odd power of 3 then $H(q)$ also contains Ree-Tits ovoids (resp. spreads) consisting of all absolute points (resp. lines) of an arbitrary polarity of $H(q)$. A Ree-Tits spread and the corresponding Ree-Tits ovoid (w.r.t. the same polarity) determine a natural ovoid-spread pairing.

The derived structure of D in x is the design $D_x = (P_x, B_x, I_x)$ with $P_x = P \setminus \{x\}$, B_x the set of all blocks or B incident with x and I_x the incidence induced by I .
 The $2-(v+1, s+2, t+1)$ design S is said to be a one-point extension of Γ if for any point x of the point set of S the derived structure of S in x is a generalized hexagon of order (s,t) and for at least one point it is isomorphic to Γ .

Results

S : one-point extension of $GH(s,t)$
 $d_i(v,z) = d_i(x,z) \quad \forall x,y,z \in S \Rightarrow s=2 \Rightarrow GH(s,t) = H(2)$

H_q : model of $H(q)$ (odd q)
 S : spread of H_q (in Π)
 ρ : Π^3 (ρ polarity associated to $Q(6,q)$)
 $g: \psi = \rho \cup \Pi \cap Q(6,q)$ = involutory collineation
 $H_2 := H$
 $\Omega :=$ common point regulus of H_1 and H_2



Π, Π' : two skew planes in $PG(5, q^2)$
 B, B' : Baer subplanes in Π and Π' respectively
 B : anti-isomorphism between Π and Π'

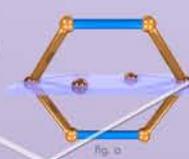


fig. a

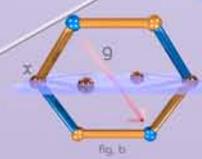


fig. b

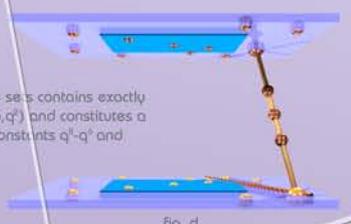


fig. d

$\Omega_1 := \{r | r \in \Pi\}$
 $\Omega_2 := \{r | r \in \Pi \cup \Pi', r \in pq \text{ with } p \in B \text{ and } q \in B'p^2\}$ (see fig. c)
 $\Omega := \{r | r \in \Pi \cup \Pi', r \in pq \text{ with } p \in \Pi \cap B \text{ and } q \in p^{-1}(\Pi' \cap B)\}$ (see fig. d)

The union of these three sets contains exactly q^2+q^2+1 points of $PG(5, q^2)$ and constitutes a two character set with constraints q^2-q^2 and $q^2-q^2+q^2$

S_{11} unique
no ovoids

$PSU_3(2)$

S_{11}, O_{11}
 S_{11}, O_{11}
 S_{11}, O_{11}

$G_2(2)$

$R(3)$

$2^2.PSL_2(2)$

S_{11}

S_{11}

no ovoids

$PSU_3(4)$

?

O_2 unique

\hookrightarrow two character set in $PG(5, 2)$

no distance-2-spreads

$P\Gamma_2(7)$

(S_{11}, O_{11})

(S_{11}, O_{11})

(S_{11}, O_{11})

S_{11}, O_{11} unique

$L_2(13)$

O_2

\hookrightarrow two character set in $PG(5, 4)$ (above $q=2$)

O_2

\hookrightarrow two character set in $PG(5, 4)$

$(q+1), \Gamma(3, 2) \times 2$

$L_2(13)$

$L_2(13)$

no 3-coloring

no 4-coloring

no 5-coloring (conjecture)

? no $q+1$ -coloring of the collineation graph of $H(q)$?
 ? $H(q)$ contains distance-2-ovoids?



analyse a signal according to scale

One-dimensional Continuous Wavelet Transform (CWT)

Idea

Wavelets are wave-like, but localized functions. One chooses the **mother wavelet** $\psi \in L_2$, dilates or contracts and shifts it

$$\psi_{a,b}(x) = \frac{1}{\sqrt{a}} \psi\left(\frac{x-b}{a}\right), \quad a > 0, b \in \mathbb{R},$$

while looking into its correlations with the analysed signal $f \in L_2$

$$F(a,b) = \int_{-\infty}^{+\infty} \overline{\psi_{a,b}(x)} f(x) dx \quad : \text{CWT of } f$$

Condition on the mother wavelet

Inner product in the space of transforms:

$$[F, G] = \frac{1}{C_\psi} \int_{-\infty}^{+\infty} \int_{-\infty}^{+\infty} \overline{F(a,b)} G(a,b) \frac{da db}{a^2}$$

CWT is an **isometry**, i.e.

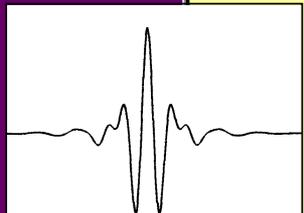
$$[F, G] = \langle f, g \rangle \quad : \text{Parseval,}$$

if ψ satisfies:

$$C_\psi = \int_{-\infty}^{+\infty} \frac{|\hat{\psi}(u)|^2}{|u|} du < +\infty \quad : \text{admissibility condition}$$

If $\psi \in L_1 \cap L_2 \Rightarrow$ admissibility condition implies

$$\int_{-\infty}^{+\infty} \psi(x) dx = 0 \quad : \text{zero momentum}$$



Clifford algebra & Clifford analysis

Clifford algebra

(e_1, \dots, e_m) : orthonormal basis of \mathbb{R}^m

basis of Clifford algebra R_m :

$$e_A = e_{i_1} e_{i_2} \dots e_{i_h} \quad A = (i_1, i_2, \dots, i_h) \subset \{1, 2, \dots, m\}$$

with $1 \leq i_1 < i_2 < \dots < i_h \leq m$

identity element: $e_\emptyset = 1$

non-commutative multiplication:

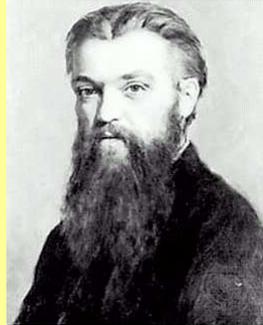
$$e_j^2 = -1, \quad j=1, \dots, m$$

$$e_j e_k + e_k e_j = 0, \quad j \neq k, \quad j, k = 1, \dots, m$$

$$Spin(m) = \{s = \omega_1 \dots \omega_{2l}; \omega_j \in S^{m-1}, j=1, \dots, 2l, l \in \mathbb{N}\}$$

with S^{m-1} : unit sphere in \mathbb{R}^m

Clifford analysis



higher dimensional analogue of the theory of holomorphic functions

Consider $F : \text{Euclidean space} \rightarrow \text{Clifford algebra}$

$F : \mathbb{R}^m \rightarrow \text{Clifford algebra}$ is **left monogenic**

\Downarrow

$$\partial_{\underline{x}} F = 0,$$

with $\partial_{\underline{x}} = \sum_{j=1}^m e_j \partial_{x_j}$: **Dirac operator**

$G : \mathbb{R}^{m+1} \rightarrow \text{Clifford algebra}$ is **left monogenic**

\Downarrow

$$(\partial_{x_0} + \partial_{\underline{x}}) G = 0,$$

with $\partial_{x_0} + \partial_{\underline{x}}$: **Cauchy-Riemann operator**

advantage: all dimensions encompassed at the same time

Higher dimensional CWT

Construction method

First step: construction of Clifford algebra-valued orthogonal polynomials

Second step: mother wavelet ψ satisfying the conditions: A) $\hat{\psi} \overline{\hat{\psi}}$ is real valued, with $\hat{\psi}$ the Fourier transform of ψ

$$B) \quad C_\psi = \int_{\mathbb{R}^m} \frac{\hat{\psi}(u) \overline{\hat{\psi}(u)}}{|u|^m} dV(u) < +\infty \quad : \text{admissibility condition}$$

Third step: continuous family of wavelets originates from the mother wavelet ψ by **dilation, translation** and **spinor rotation**:

$$\psi^{a,b,s}(x) = \frac{1}{a^{m/2}} s \psi\left(\frac{\bar{s}(x-b)s}{a}\right) \bar{s}, \quad a \in \mathbb{R}_+, b \in \mathbb{R}^m, s \in Spin(m)$$

Fourth step: the associated CWT applies to $f \in L_2(\mathbb{R}^m)$ by: $F_\psi(a,b,s) = \int_{\mathbb{R}^m} \overline{\psi^{a,b,s}(x)} f(x) dV(x)$

EXAMPLES: Clifford-Hermite, Clifford-Gegenbauer and Clifford-Laguerre polynomials