The 13th Annual Alberta College Mathematics Conference (ACMC)
&
North-South Dialogue (N-S)

May 2-3, 2013
Department of Mathematics and Statistics.
University of Calgary

PIMS

UNIVERSITY OF CALGARY

Alberta Innovates Technology Futures

2013 ALBERTA COLLEGES MATHEMATICS CONFERENCE AND NORTH-SOUTH DIALOGUE

ORGANIZING COMMITTEE

Timur Akhunov, University of Calgary
Manny Estabrooks, Red Deer College
Hassan Safouhi, University of Alberta, Campus St. Jean
Peter Zvengrowski, University of Calgary (principal organizer)

LOCAL ORGANIZERS

Ted Bisztriczky Nancy Chibry Pearl Paterson Elaine Zvengrowski

ASSISTANTS

Salam Alnabulsi Michael Pors Pooneh Pordeli Clifford Zvengrowski

HISTORICAL BACKGROUND

The first North-South Dialogue was organized by Ted Bisztriczky and Akbar Rhemtulla, the respective Heads of the departments at the University of Calgary and the University of Alberta, in 2001. The original purpose was to foster more communication between the two large universities in the province, and to introduce new faculty to the Alberta mathematical community. The meeting soon became more inclusive as other universities and colleges in the province participated. In 2002 it was first supported by PIMS (Pacific Institute of Mathematical Sciences) and this support has been ongoing since then. By 2007 the format was slightly modified to more or less its present form, the first day being the Alberta Colleges Mathematics Conference (mainly educational issues) and the second day the North-South Dialogue (mainly research issues). The ACMC had in fact originally first met at Red Deer College in 1986 and 1988, but with small attendance it was discontinued. It was later revived to the present format alongside the N-S, to the benefit of both meetings. The previous venues for the meetings are as follows.

2001 University of Calgary
2002 University of Alberta
2003 University of Calgary (the infamous "blizzard" meeting, partially cancelled due to a major blizzard, successfully rescheduled in the summer)
2004 Red Deer College
2005 University of Alberta
2006 Mt. Royal College (now Mt. Royal University)
2007 Grant MacEwan College (now MacEwan University)
2008 University of Calgary
2009 Red Deer College
2010 MacEwan University
2011 Mt. Royal University
2012 University of Alberta, Campus St. Jean
2013 University of Calgary
2014 Augustana College, Camrose (proposed)

May 2nd, 2013 - Alberta College Mathematics Conference: Schedule

All presentations on May 2 take place in Science Theatre 141. Registration, coffee/snacks, and publisher displays will be in the hallway outside this room. Contributed talks are 20 minutes with 5 minutes for questions and invited talks are 1 hour.

Hours		Speaker/Event	Title	Chair
8:00	16:00	Registration		
9:00	9:15	8:30-9:00	Light breakfast/Coffee at 8:30 am Opening Remarks	
9:15	10:15	Invited Lecture: Melania Alvarez	Mathematics Outreach: Getting Mathematicians Involved	Robert Woodrow
10:15	10:40	Coffee break		
10:40	11:30	Kris Reid and Christine Henzel	An Overview of the Alberta High School Mathematics Program of Studies	Robert Woodrow
11:30	11:55	Eric Roettger	Motivating Continued Fractions by Solving A New Generalization of the Golden Ratio	Roberta LaHaye
11:55	12:20	Pamini Thangarajah	New Mathematics Minor for Elementary Education at MRU	
12:20	12:45	Peter Zizler	Quiz Today: Should I skip class?	
12:45	14:00	Lunch in Empty Space Room, Macewan Student Centre		
14:00	15:00	Invited lecture: R James Milgram	K-12 Educational Practices in the United States and their Consequences	Peter Zvengrowski
15:00	15:25	Nataliya Zadorozhna	From quaternions to computer games	Tiina Hohn
15:25	15:50	Wanhua Su	Some Challenges in Teaching Introductory Statistics	
15:50	16:20	Coffee break		
16:20	16:45	Jeremy Sylvestre	The WeBWorK Homework System	Manny Estabrooks
16:45	17:15	Siwei (Alfred) Ye	Teaching Mathematics Online with High Quality Visualizations	
17:15	17:45	Aidan Inglis and Claude Laflamme	Lyryx Service Course Solutions (LSCS)	
17:45	18:30	Open discussion about current difficulties in post-secondary education in Alberta, especially in the light of the recent provincial budget		
18:30	21:30	Banquet, Blue Room in University Dining Centre. Please present your ticket when entering. Cash bar starting 18:30, dinner at 19:00.		

The 13th Annual Alberta Colleges Mathematics Conference

May 3rd, 2013- North South Dialogue in Mathematics

Contributed talks are 20 minutes with 5 minutes for questions, Invited talks are 1 hour. Registration and coffee are in the department lounge on the 4th floor of Math Sci Bldg

Hours		**Speaker/Event**	**Room**	**Chair**
8:30	16:00	Registration		
8:30	9:00	Coffee/Light breakfast	MS Lounge	
9:00	10:00	Plenary Lecture: Renzo Piccinini "Fibrations"	ST 141	Roberto Bencivenga
10:00	10:25	Coffee	MS Lounge	
10:25	11:40	Parallel Sessions		
		Session on Applied and Computational Harmonic Analysis	MS 431	Elena Braverman
		Session on Algebra and Geometry	MS 427	Eric Roettger
		Session on Applied Math	MS 325	Thomas Hillen
11:40	12:55	Lunch in Empty Space Room, Macewan Student Centre		
12:55	13:55	Plenary Lecture: Thomas Hillen "Mathematical Modelling of Cancer"	ST 141	Hassan Safouhi
13:55	15:10	Parallel Sessions		
		Session on Partial Differential Equations	MS 431	Peter Zizler
		Session on Statistical methodologies and data analysis	MS 427	Jingjing Wu
		Session on Analysis and Geometry	MS 325	Hassan Safouhi
15:10	15:40	Coffee	MS Lounge	
15:40	16:40	Invited Lecture, Richard Cushman "A new normal form for an n by n matrix"	ST 141	Jedrzej Sniatycki
16:40	16:55	Closing Remarks	ST 141	

May 3, 2013 - North South Dialogue in Mathematics

Hours		Speaker/Event	Title	Room/Chair
		Session on Applied and Computational Harmonic Analysis		MS 431
10:25	10:50	Bin Han	Discrete framelet transform and its current developments	Elena Braverman
10:50	11:15	Yi Shen	Image denoising in the wavelets domain: a low rank approach	
11:15	11:40	Zhenpeng Zhao	Tensor product approach to dual-tree complex wavelet transform	
		Session on Algebra and Geometry		MS 427
10:25	10:50	Aiden A Bruen	Perspective sets and Dickson's theorem on linear groups	Eric Roettger
10:50	11:15	Soroosh Yazdani	Mordell-Weil Sieve and Covering Systems	
11:15	11:40	David Krebes	An Invariant of Collections of Loops Immersed in the Plane.	
		Session on Applied Math		MS 325
10:25	10:50	Andreas Buttenschoen	An ordinary differential equation model for the interactions between tumour cells and M1 & M2 macrophages.	Thomas Hillen
10:50	11:15	Samuel Reid	A Combinatorial Approach to Quantum Error Correcting Codes	
11:15	11:40	Quinton Farr	Liouville-Type Theorems for models of Ferrohydrodynamics	
		Session on Partial Differential Equations		MS 431
13:55	14:20	Ion Bica	Intuitive Grounds in deriving the Kadomtsev-Petviashvili Equations	Peter Zizler
14:20	14:45	Timur Akhunov	A sharp condition for the well-posedness of the linear KdV equation on R	
14:45	15:10	Richard Slevinsky	Double Exponential Sinc-Collocation Methods for Computing Energy Levels of the Schrodinger Equation with Anharmonic Potentials	
		Session on Analysis and Geometry		MS 325
13:55	14:20	Prachi Loliencar	Exploring the Hahn-Banach Theorem and its Geometric Interpretation	Hassan Safouhi
14:20	14:45	Cristian Ivanescu	The Cuntz semigroup and its properties	
14:45	15:10	Jedrzej Sniatycki	Differential Geometry of Stratified Spaces	
		Session on Statistical methodologies and data analysis		MS 427
13:55	14:20	Chao Qiu	On Single Period Discrete Time Delta Hedging and Pricing Analysis Using Tail Ordering	Jingjing Wu
14:20	14:45	Xuewen Lu	Variable Selection for High-dimensional Generalized Partially Linear Models with an Application to Cancer Classification	
14:45	15:10	Karen Kopciuk	Estimating successive cancer risks in Lynch Syndrome families using a progressive three-state model	

Invited Lecture 1 [Science Theatre (ST) 141]	
Speaker	Melania Alvarez
Bio	 Melania Alvarez holds a joint appointment as BC Education Coordinator at the Pacific Institute for the Mathematical Sciences and as Outreach Coordinator for the UBC Department of Mathematics. Since assuming this position in 2005, she has worked on improving mathematics education at all levels, working with students, teachers, parents, and their community as a whole. Each year, she helps organize math workshops for elementary and secondary school teachers; mentorship programs; summer camps; homework clubs and a variety of other math competitions and events. In many of these activities, she uses games and puzzles and her own sense of fun to give a lively spirit to the proceedings. She also engages in active fund-raising to support a wide range of education activities. Melania Alvarez is the 2012 winner of the Canadian Mathematical Society Adrien Pouliot Award for her contributions in promoting mathematics learning across Canada.
Title	Mathematics Outreach: Getting Mathematicians Involved
Abstract	In this lecture I will describe some of the many mathematics outreach activities organized by the Pacific Institute for the Mathematical Sciences and the UBC Mathematics Department. In particular the lecture will focus on activities in British Columbia meant to enhance the mathematical opportunities for Aboriginal/First Nations teachers and students and the many challenges we face. This represents efforts by many dedicated educators and mathematical scientists in Western Canada.

Lecture 2 [Science Theatre (ST) 141]	
Speaker	Kris Reid and Christine Henzel
Institution	Alberta Education
Title	Mathematics Outreach: Getting Mathematicians Involved
Abstract	The Alberta Mathematics 10 – 12 Program of Studies has been revised with an emphasis on conceptual understanding and the development of mathematical processes. The programming options allow for flexibility and choice as students prepare for their goals after high school, whether it be post-secondary studies, an apprenticeship program or direct entry into the workforce. Students entering post-secondary institutions in September 2013 will be the first students who have taken high school mathematics in the revised program. This session will focus on an overview of the program content and philosophy so that session participants can plan for the upcoming school year.

All May 2 talks are in ST 141

11:30	11:55	Eric Roettger	Motivating Continued Fractions by Solving A New Generalization of the Golden Ratio

Title: Motivating Continued Fractions by Solving A New Generalization of the Golden Ratio

Abstract: Often puzzles are used to motivate mathematics at the elementary school level. But by the time students are in university topics in math are likely no longer explored through puzzles, but rather motivated through applications or historical context. In this talk a new puzzle will be discussed and how it can be used to encourage university students to learn a new topic.

11:55	12:20	Pamini Thangarajah	New Mathematics Minor for Elementary Education at MRU

Title: New Mathematics Minor for Elementary Education at MRU

Abstract: In this talk I will give an over view of the new minor in mathematics for elementary education. I will also share my experiences in the development of the program as well as in teaching the new courses.

12:20	12:45	Peter Zizler	Quiz Today: Should I skip class?

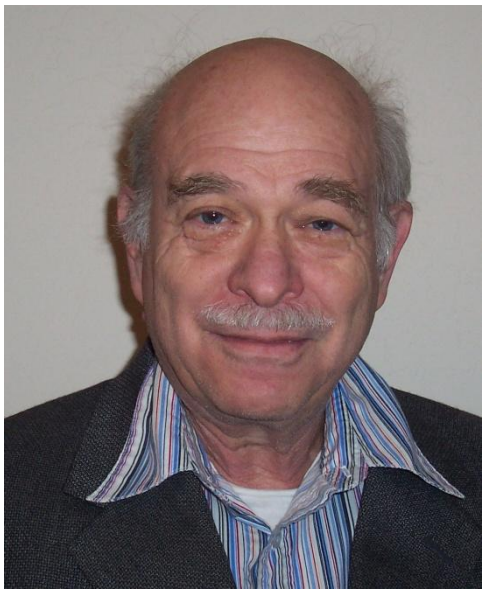
Title: Quiz Today: Should I skip class?

Abstract: A common practice in our department is to allow students to choose the best k test scores from the n tests written, a policy we call selective assessment. In our presentation we will study the possible grade inflation that might arise from this selective assessment practice.

14:00	15:00	Invited lecture: R James Milgram	K-12 Educational Practices in the United States and their Consequences

Bio: R. James Milgram has been a Professor of Mathematics at Stanford University since 1969. Before that he was on the faculty at Princeton University, and the University of Illinois at Chicago.

Milgram's research is in the areas of differential and geometric topology together with their applications. In recent years he has been applying these techniques in robotics and in studying the mathematics of protein folding. He has been the Gauss Professor at the University of Goettingen, and has received numerous awards for his work in mathematics.



During the late 1990's he devoted much of his time to working with the state of California helping write California's 1998 Mathematics Standards and the 1999 Mathematics Framework, as well as on the 1999 and 2000 California textbook adoptions. Then he and H.-H. Wu at UC Berkeley helped design the requirements for mathematics intervention programs and for algebra readiness programs for California.

Milgram has worked with a number of other states including Florida, Massachusetts, Michigan, Georgia, Utah, and New York on their mathematics standards, and has worked extensively with Achieve as a member of their Mathematics Advisory Panel. He served on the National Board for Education Science, and the NASA Advisory Council, as well as the NAC Human Capital Committee. He also served as a member of the Validation Committee for the new Core Standards, as well as a number of other boards. Milgram has lectured widely on the issues in K-12 mathematics education. He has also presented invited testimony on these issues before Congress, the National Mathematics Advisory Commission, as well as many State Legislatures.

Abstract: The education schools in the U.S. focus on issues of "social justice" almost to the exclusion of subject knowledge. The result is a virtually universal perspective on the part of our K-12 school systems that

1. The focus of education is almost exclusively limited to the lowest 20% of students.

2. The overriding belief is that the schools are doing well if and only if the 20% focus students are successful. But it is virtually universal that administrators and teachers believe demographics determines talent. Thus, an inevitable consequence is a tremendous pressure to "dumb down" the material in the courses to the point where even these "weakest" students will pass.

3. The content knowledge that the education schools focus on for elementary teachers is almost exclusively in teaching reading. Math is an afterthought and many, if not most, of the faculty that teach math methods courses assert that math is innate, and teachers do not need to learn it, as they will understand what they need when they need it. Of course, as bad as the preparation is in mathematics, it is worse in science, where, typically, even science methods courses are not offered.

4. There is virtually no actual research done by the hard core faculty in our education schools, in spite of the fact that that they typically write far more articles published in research journals than we do. As a result, when a paper is written and advertised as being about educational outcomes in an area such as mathematics, it is not read but it is quoted because it is assumed that the results will simply align with their pretty much universal expectations. The growing difficulties that we have with the outcomes of our K-12 public education system are not too difficult to explain, but they are much harder to fix.

15:00	15:25	Nataliya Zadorozhna	From quaternions to computer games

Institution: MacEwan University

Abstract: The journey from the obscurity of quaternions to their practical connection to the spacial rotations and a computer gaming industry is presented

15:25	15:50	Wanhua Su	Some Challenges in Teaching Introductory Statistics

Institution: Mount Royal University

Abstract: I have taught at the Grant MacEwan University for three years. As a junior instructor without a lot of experience, I have encountered some challenges in teaching introductory statistics such as teaching P-value, making statistics spicy, and being on schedule. In this talk, I would like to share some of my experience and my approaches to address those issues. If time permits, I would like to open a discussion to get feedback on my peers' approaches to those challenges.

16:20	16:45	Jeremy Sylvestre	The WeBWorK Homework System

Abstract: In this talk I will outline the WeBWorK installation and use at Augustana Campus, discuss what I have learned about writing new problems for the system, and make a proposal for a Campus Alberta WeBWorK installation.

16:45	17:15	Siwei (Alfred) Ye	Teaching Mathematics Online with High Quality Visualizations

Institution: University of Alberta

Abstract: As the world continue to increase in bringing many course materials online in the form of Massive Open Online Courses, how can we best facilitate learning of mathematics with the use of visualization in online video course environments? The presentation looks at how the implementation of high quality and realistic visualization can help students and viewers learn mathematics in these environments.

17:15	17:45	Aidan Inglis and Claude Laflamme	Lyryx Service Course Solutions (LSCS)

Abstract: This lecture will provide information about the on-line learning system Lyryx Service Course Solutions (LSCS). LSCS is targeted at service courses in Calculus, Linear Algebra, and Introductory Statistics, and includes Open Texts, Online (formative) Assessment, Supplementary Materials, and Instructor + Student support 365 days a year.

9:00	10:00	Plenary Lecture: Renzo Piccinini "Fibrations"	ST 141

Bio: Professor Piccinini was born 16/5/1933 in Brazil. He obtained his B.Sc. at the Universidade de S. Paulo (Brazil), and his Ph.D. at the University of Wisconsin-Madison. He has taught at Universidade de S. Paulo, Memorial University of Newfoundland, University of Milan, and now is an Adjunct Professor at Dalhousie University. He has been President of the Canadian Mathematical Society, Co-editor in chief of the Canadian Mathematical Bulletin, Executive Vice-president of the National Institute for Advanced Mathematics (Rome, Italy), and a member of the Board of Directors of the European Mathematical Society. In addition to many research papers he has published 7 books: the latest two are Simplicial objects in topology (with Davide Ferrario), Springer Verlag 2010; Fibrations and their classification (with Petar Pavesic), Heldermann Verlag 2013.

Abstract: The concept of Fibrations is one of the great unifying mathematical ideas. Together with Fibre Bundles (which preceded Fibrations) they give formal expression to the idea of a continuous family of spaces, and of operations on such families.

In this talk I will give a historical review of the evolution of the Theory of Fibrations. No prior knowledge of topology is necessary.

		Session on Applied and Computational Harmonic Analysis		MS 431
10:25	10:50	Bin Han	Discrete framelet transform and its current developments	Elena Braverman
10:50	11:15	Yi Shen	Image denoising in the wavelets domain: a low rank approach	
11:15	11:40	Zhenpeng Zhao	Tensor product approach to dual-tree complex wavelet transform	

Bin Han**.**
Abstract. Tensor product orthogonal and biorthogonal wavelets have been widely used in many applications. However, it is known that tensor product wavelets are only suboptimal for handling high-dimensional problems due to their lack of directionality. To enhance the performance of tensor product wavelets for handling high-dimensional problems such as image processing, in this talk we discuss the approach of framelets which have redundancy by allowing more high-pass filters in a framelet filter bank than in a classic wavelet filter bank. In this talk, we shall discuss some basic properties of a discrete framelet transform and explore some recent developments on directional tight framelet filter banks.

Yi Shen.

Abstract. Many nonlocal image denoising algorithms have been developed in recent years. The basic approach is finding the similar patches for the given one. These patches can be combined together and viewed as a low rank matrix. Then some efficient low rank approaches are used to handle it. When the noise level is high, the careful choices for the distance between the patches and the original patch should be considered. In this talk, we give some discussion on extracting the patches taking advantage of the wavelets transform.

Zhenpeng Zhao.

Abstract. In this talk, we address a new approach to dual-tree complex wavelet transform based on the construction of tensor product filters in the frequency domain. The dual-tree complex wavelet transform will be explained firstly, then followed by the construction of tensor product filters that are used in this approach. Lastly we expand this tensor product method to more directions and give some numerical results on the application in image denoising.

		Session on Algebra and Geometry		MS 427
10:25	10:50	Aiden A Bruen	Perspective sets and Dickson's theorem on linear groups	Eric Roettger
10:50	11:15	Soroosh Yazdani	Mordell-Weil Sieve and Covering Systems	
11:15	11:40	David Krebes	An Invariant of Collections of Loops Immersed in the Plane	

Aiden A Bruen**.**

Abstract. We study the question of characterizing a pair of finite sets of points, each lying in an hyperplane, where the two sets are in perspective from at least two centres. The setting is any affine or projective space over any field. Motivating examples are presented. All possible such pairs are then characterized ,using a generalization of Dickson's classical theorem on linear groups. Combinatorial applications to blocking sets are presented, time permitting.

Soroosh Yazdani.

Abstract. One of the main questions in number theory is finding rational points on high genus curves. When there are no rational points on this curve, we can usually use a method known as Mordell-Weil sieve. In this talk, we show how Mordell-Weil sieve can be used for a particular Diophantine equation. We also show that the success of this method is closely related to covering system of integers.

David Krebes**.**

Abstract. We define an integer invariant of systems of loops immersed in the plane and describe some of its properties. Applications to knot theory are discussed.

		Session on Applied Math		MS 325
10:25	10:50	Andreas Buttenschoen	An ordinary differential equation model for the interactions between tumour cells and M1 & M2 macrophages.	Thomas Hillen
10:50	11:15	Samuel Reid	A Combinatorial Approach to Quantum Error Correcting Codes	
11:15	11:40	Quinton Farr	Liouville-Type Theorems for models of Ferrohydrodynamics	

Andreas Buttenschoen.

Abstract. The interactions between cancer cells and the immune system are highly complex but offer the hope of a non-invasive treatment strategy against cancer. In this paper we develop an ordinary differential equation model based on the law of mass action to model the interactions between M1 and M2 macrophages and tumour cells. We show that as the cancer evolves cancer cells are selected for the phenotype that can recruit M2 macrophages and is resistant against other immune mediated killing. Further, we will show macrophages are selected for the M2 phenotype which promotes cancer development. We show with numerical solutions that macrophages alone can eliminate the bulk of cancer.

Samuel Reid.

Abstract. Motivated from the theory of quantum error correcting codes, we investigate a combinatorial problem that involves a symmetric n-vertices graph and a group of operations on the graph. We provide an explicit algorithm for computing the solution of our problem, which in turn is directly related to the distance (performance) of the underlying quantum error correcting code. Computing the distance of a quantum code is a highly non-trivial problem and our method may be of use in the construction of better codes.

Quinton Farr.

Abstract. This talk will discuss conditions for smooth stationary solutions to the Rosensweig and Shliomis models of ferrohydrodynamics to be trivial. First ferrofluids will be introduced. Next, a brief description of the models of ferrohydrodynamics will be given. Afterwards, the conditions for trivial solutions will be discussed, and a sample calculation given for finding such conditions.

12:55	13:55	Plenary Lecture: Thomas Hillen “Mathematical Modelling of Cancer”	ST 141

Abstract: Most of us have encountered cancer in our families or friends as a devastating and live changing disease. In my talk I will discuss how mathematical modeling can help in the fight of cancer. I will start with a scientists-view of cancer and tumors and summarize mathematical approaches that are used. I will particularly highlight the optimization of radiation treatment, the role of cancer stem cells, and anisotropic spread of brain tumors.

Bio:

Thomas Hillen is a Professor in Applied Mathematics at the University of Alberta and Associate Chair for Graduate Studies. He got his PhD from Tuebingen (Germany) in 1995 and came to the UofA in 2001. His area of research is in Mathematical Biology with a focus on cancer modelling, cell movement and forest fires. He is internationally well known for his expertise in partial differential equations as models for biological problems. Currently, T. Hillen serves as associate editor on four international journals, including the J. Math. Biol. and SIAM J. Appl. Math. He has been Director of the Applied Mathematics Institute, Project leader of a MITACS full project on forest fires and he was Section chair at NSERC EG 1508. T. Hillen has written about 60 scientific publications, two textbooks and he actively supervises HQP on all levels.

		Session on Partial Differential Equations		MS 431
13:55	14:20	Ion Bica	Intuitive Grounds in deriving the Kadomtsev-Petviashvili Equations	Peter Zizler
14:20	14:45	Timur Akhunov	A sharp condition for the well-posedness of the linear KdV equation on R	
14:45	15:10	Richard Slevinsky	Double Exponential Sinc-Collocation Methods for Computing Energy Levels of the Schrodinger Equation with Anharmonic Potentials	

Ion Bica.

Abstract. In 1895, Korteweg and de Vries derived an equation to describe one-dimensional, small-amplitude, long surface gravity waves propagating in shallow water of uniform depth. The KdV equation, u_t+6uu_x+u_xxx=0, has applications in several physical settings such as internal solitons in the ocean and non-linear acoustics of bubbly liquids. The restriction in the application of the KdV equation as a practical model is that it is strictly one-dimensional (one spatial dimension plus time). However, in 1970, Kadomtsev and Petviashvili derived a two-dimensional generalization of the KdV equation under the assumption that the waves are almost one-dimensional locally. Their derivation was based on physical intuition, and as I am a strong believer that Math is a great tool to explain Physics, I was intrigued by the possibility of deriving it mathematically.

Timur Akhunov.

Abstract. In this talk wellposedness of a linear KdV equation on the real line is investigated. This equation is a model problem, whose understanding has applications to quasilinear KdV-type equations. The third derivative term makes this equation dispersive and when it degenerates the equation can be illposed. In the non-degenerate case, the wellposedness depends on the balance of the regularizing dispersive effect and the destabilizing backward heat effect. This balance is the main focus of the talk.

In the talk I will formulate a sharp condition based on the relative strength of dispersive and non-dispersive effects that separates wellposedness from illposedness. This condition is similar to the Mizohata condition for the Schrödinger equation. A modified energy method is used to show wellposedness, and illposedness is established with an explicit construction.

Richard Slevinsky.

Abstract. Computing energy levels of the Schrodinger equation is a research area that has seen contributions from many researchers over the years. The most fundamental potentials, from a mathematical perspective, have been anharmonic oscillators where the potential is an even polynomial potential. Using the double exponential Sinc-collocation method (DESCM), we develop a highly efficient and accurate algorithm for computing energy eigenvalues of this Hamiltonian. A method for finding the optimal step size given the number of collocation points is also introduced. This method is based on asymptotic representation of the derivative of the trace of the matrix obtained through the DESCM. Numerical examples with an array of different values for the coefficients demonstrate the linear convergence of the DESCM for the eigenvalues and eigenfunctions.

		Session on Analysis and Geometry		MS 325
13:55	14:20	Prachi Loliencar	Exploring the Hahn-Banach Theorem and its Geometric Interpretation	Hassan Safouhi
14:20	14:45	Cristian Ivanescu	The Cuntz semigroup and its properties	
14:45	15:10	Jedrzej Sniatycki	Differential Geometry of Stratified Spaces	

Prachi Loliencar.

Abstract. The Hahn-Banach Theorem is one of the most fundamental theorems in Functional Analysis with applications spreading out to geometry, convex programming, duality theory, control theory and even thermodynamics. This presentation intends to introduce the Hahn-Banach Theorem and its results, and to discuss the rich geometric interpretation of the theorem. It will present the two general versions of the Hahn-Banach Theorem - the Extension Theorem and the Separation Theorem. While the former is important in functional analysis, the latter is a geometric version of the theorem, dealing with separation of convex sets.

Cristian Ivanescu.

Abstract. An introduction to the Cuntz semigroup will be presented together with its properties. Among the properties of the Cuntz semigroup, the behaviour under tensor product will be discussed. This last property is part of a joint work with D. Kucerovsky (University of New Brunswick).

Jedrzej Sniatycki.

Abstract. We discuss how the stratification structure of the space of orbits of a proper action of a Lie group G on a manifold M can be decoded from the structure of the ring of G-invariant smooth functions on M.

		Session on Statistical methodologies and data analysis		MS 427
13:55	14:20	Chao Qiu	On Single Period Discrete Time Delta Hedging and Pricing Analysis Using Tail Ordering	Jingjing Wu
14:20	14:45	Xuewen Lu	Variable Selection for High-dimensional Generalized Partially Linear Models with an Application to Cancer Classification	
14:45	15:10	Karen Kopciuk	Estimating successive cancer risks in Lynch Syndrome families using a progressive three-state model	

Chao Qiu **.**

Abstract. In an incomplete market, there are an infinite number of risk neutral measures, and each of them may lead to a different option price and different hedging performance. Stochastic ordering is a widely tool to compare distributions. We apply the tool to compare the distribution under different risk neutral measures, and investigate their option prices and hedging performance.

Xuewen Lu.

Abstract. In cancer classification problems based on microarray technology, hundreds or even thousands of gene expression patterns are used to inform the sample status. There exist various approaches to such problems, typically based on variable selection techniques to reduce the dimension. However, in addition to genetic information, there is also a clinical variable, such as age of the patient, which is potentially informative about cancer status. We propose to use generalized partially linear models to incorporate both sources of information. In particular, we adopt a penalized quasi-likelihood approach for simultaneous variable selection and estimation in generalized partially linear models with the number of predictors possibly exceeding the sample size. The nonparametric component is approximated by polynomial splines while an adaptive lasso penalty is employed to identify significant variables in the linear component. We present asymptotic properties and simulation results demonstrating the favorable performance of the proposed estimator. Finally, we apply the method to the leukemia dataset.

Karen Kopciuk.

Abstract: Lynch Syndrome (LS) families harbour mutated mismatch repair genes that predispose them to specific types of cancer. Since they can experience multiple cancers over their lifetimes, we developed a progressive three-state model to estimate disease risk from Healthy (state 0) to a First Cancer (state 1) and then to a Second Cancer (state 2). Ascertainment correction of the likelihood was made to adjust for complex sampling designs, with estimated carrier probabilities for family members with missing genotype information based on the observed genotype and phenotype information. The main objective of this paper is to estimate the disease risk (penetrance) for the time to a second cancer, after someone has experienced a first cancer that is also associated with a mutated gene. Simulation study results indicate our methods are generally unbiased and have low root mean squared errors across different family study designs, proportions of missing genotype information and risk heterogeneities. An application to 12 large LS families from Newfoundland demonstrates that the risk for a second cancer was nearly as great as for a first cancer and the time to a first cancer impacted the time to development of a second one. This study provides new insights for developing more effective management of mutation carriers in LS families by providing more accurate multiple cancer risk estimates.

15:40	16:40	Invited Lecture, Richard Cushman “A new normal form for an n by n matrix”	ST 141

Abstract: This talk concerns determining a normal form for a linear map A of a finite dimensional vector space V over a field k, which can be computed using only rational operations in k. Classically, the companion matrix of A is such a normal form. But this does not give any idea of the structure of A. First we observe that finding the Jordan decomposition of A into the sum of a semisimple linear mapping S and a commuting nilpotent linear mapping N can be determined using only rational operations in k. Computing the nilpotent Jordan normal form of N, we show that the generating vectors of the Jordan chains of N form an S-invariant subspace of V. This gives rise to a new normal form for A called the uniform normal form.

Bio: Professor Cushman is currently an Adjunct Professor in the Department of Mathematics and Statistics of the University of Calgary, having retired from a position in the Mathematics Department of the University of Utrecht. He is married, has written two books, and has published about one hundred research papers, mostly in the field of integrable Hamiltonian dynamical systems.