BRÅKET

Information om seminarier och högre undervisning i matematiska ämnen i Stockholmsområdet

NR 21 **FREDAGEN DEN 29 MAJ 2009**

BRÅKET

Veckobladet från Institutionen för matematik vid Kungl Tekniska Högskolan och Matematiska institutionen vid Stockholms universitet

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Sista manustid för nästa nummer: Torsdagen den 4 juni kl. 13.00.

11'th Stockholm-Uppsala Symposium in Mathematical Statistics

Detta skall äga rum vid SU onsdagen den 3 juni. Se Bråket nr 20 sidan 6.

Europeiska forsknings- och utvecklingsprogram — En presentation

Denna skall äga rum vid KTH onsdagen den 10 juni. Se sidan 14.

SEMINARIER

Seminarielistan börjar på sidan 2.

Disputation i matematik

Henrik Strohmayer skall disputera på avhandlingen *Prop profiles of compatible Poisson and Nijenhuis structures* tisdagen den 2 juni kl. 13.00 i sal 14, hus 5, Matematiska institutionen, SU, Kräftriket. Se Bråket nr 20 sidan 9.

Miniworkshop in PDE and Potential Theory

Denna skall äga rum vid SU torsdagen den 4 juni. Se sidan 11.

Disputation i matematik

Lisa Nilsson skall disputera vid SU på avhandlingen *Amoebas, Discriminants, and Hypergeometric Functions* fredagen den 5 juni kl. 13.00. Se sidorna 12 – 13.

Disputation i matematik

Erik Lindgren skall disputera vid KTH på avhandlingen *Regularity properties of two-phase free boundary problems* fredagen den 5 juni kl. 14.00. Se sidan 13.

Disputation i optimeringslära och systemteori

Yohei Kuroiwa skall disputera vid KTH på avhandlingen *A Parameterization of Positive Real Residue Interpolants with McMillan Degree Constraint* fredagen den 12 juni kl. 10.00. Se sidan 15.

Belöningar till KTH-matematiker

Styrelsen för Göran Gustafssons Stiftelse har beslutat att fyra matematiker vid KTH skall få det mindre Gustafssonpriset till yngre forskare. Se sidan 15.

SEMINARIER

Fr 05–29 kl. 14.30. Kista Science Seminar. Lars Bergström, Fysikum, SU: *Dark matter, dark energy and black holes.* Sal C1, Electrum, Isafjordsgatan 22, Kista. Se Bråket nr 19 sidan 10.

Må 06–01 kl. 15.15–16.00. Seminarium i finansiell matematik. Niklas Westermark presenterar sitt examensarbete på grundnivå: *Barrier Option Pricing.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 4.

Må 06–01 kl. 16.15–17.00. Seminarium i finansiell matematik. Tetiana Soviak presenterar sitt examensarbete: *Financial outcomes of investing into socially responsible companies.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 5.

Ti 06–02 kl. 13.15–14.15. DNA-seminariet Uppsala-KTH (Dynamical systems, Number theory, Analysis). Tom Sanders, Institut Mittag-Leffler: *Modelling Roth's theorem on three term arithmetic progressions.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 6.

Ti 06–02 kl. 14.00–15.00. Institut Mittag-Leffler Seminar. Bálint Tóth, Budapest University of Technology: *Long time asymptotics of self-repelling random walks.* Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 6.

Ti 06–02 kl. 15.30–16.30. Institut Mittag-Leffler Seminar. Gabor Pete, Microsoft Research: *The scaling limits of dynamical and near-critical percolation, and the Minimal Spanning Tree.* Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 7.

On 06–03 kl. 9.30. Logikseminariet Stockholm-Uppsala — Presentation av examensarbete i matematik. Fredrik Nordvall Forsberg: *Constructive aspects of models for non-standard analysis.* Sal Å11167, Ångströmlaboratoriet, Uppsala universitet. Se sidan 4.

On 06–03 kl. 10.00–11.00. Presentation av examensarbete i matematik. Martin Strömqvist: *The Newtonian potential obstacle problem in perforated domains.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 9.

On 06–03 kl. 10.00–11.00. Presentation av examensarbete i matematik (15 högskolepoäng, grundnivå). **Ulrica Gustafsson:** *Modellering av reaktioner i en lösning innehållande proteinmolekyler och metalljoner.* Handledare: **Hans Rullgård.** Sal 21, hus 5, Matematiska institutionen, SU, Kräftriket. Se sidan 8.

On 06–03 kl. 10.15–11.15. Kombinatorikseminarium. Gil Kalai, Hebrew University of Jerusalem: *A mathematical dialogue in Discrete Geometry with Jürgen Eckhoff.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 8.

On 06–03 kl. 11.00–12.00. KTH/Nordita/SU Seminar in Theoretical Physics. Zhenhua Yu: *Short-range correlations and entropy in ultracold atomic Fermi gases.* Sal FA31, Roslagstullsbacken 21, AlbaNova universitetscentrum. Se Bråket nr 20 sidan 7.

Fortsättning på nästa sida.

Seminarier (fortsättning)

On 06–03 kl. 11.15 – 12.15. Presentation av examensarbete i matematik (15 högskolepoäng, grundnivå). **Maya Brandi:** *Mönstersökning — en gradientrelaterad metod.* Handledare: **Yishao Zhou.** Sal 21, hus 5, Matematiska institutionen, SU, Kräftriket. Se sidan 7.

On 06–03 kl. 13.15. Algebra and Geometry Seminar. Håkan Granath, Karlstads universitet: *Explicit rational models of Shimura curves.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 9.

On 06–03 kl. 16.00. KTH/SU Mathematics Colloquium. Professor Jonathan P. Keating, University of Bristol: *Random matrices and number theory.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Kaffe/te serveras kl. 15.30 i pausrummet, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 4. Se Bråket nr 20 sidan 7.

To 06–04 kl. 10.00. Licentiatseminarium i matematik. Qimh Xantcha presenterar sin licentiatavhandling: *Polynomiality.* Opponent: **Professor Volodymyr Mazorchuk,** Uppsala universitet. Rum 306 (Cramérrummet), hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 10.

To 06–04 kl. 10.00. Licentiatseminarium i statistik. Cletus Kum Kwa lägger fram sin licentiatavhandling: *Bayesian Analysis of Two Malaria Treatments and Probability Modelling of Malaria Parasite Genotypes.* Diskutant: **Docent Martin Sköld,** Örebro universitet. Sal B705, Statistiska institutionen, SU, Universitetsvägen 10B, plan 7, Frescati. Se sidan 10.

To 06–04 kl. 13.15 – 14.15. Algebra and Geometry Seminar. *(Extra seminarium. Observera dagen!)* **René Birkner,** Berlin: *Incoherent components of the Toric Hilbert Scheme.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 12.

To 06–04 kl. 13.15. Plurikomplexa seminariet. *(Observera dagen!)* **Robert Berman,** Göteborg: *Sharp inequalities for determinants of Toeplitz operators and $\overline{\partial}$-Laplacians.* Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 6.

To 06–04 kl. 14.00 – 15.00. Institut Mittag-Leffler Seminar. Gil Kalai, Hebrew University of Jerusalem: *Noise sensitivity.* Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 5.

To 06–04 kl. 15.15 – 16.15. AlbaNova and Nordita Colloquium in Physics. Professor Bernhard Mehlig, Göteborgs universitet: *Collisions of particles suspended in turbulent flows.* Oskar Kleins auditorium, Roslagstullsbacken 21, AlbaNova universitetscentrum. Se Bråket nr 20 sidan 5.

To 06–04 kl. 15.30 – 16.30. Institut Mittag-Leffler Seminar. Svante Janson, Uppsala universitet: *Audience's choice.* Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 13.

On 06–10 kl. 18.00 – 19.00. Offentlig föreläsning på Kungl. Vetenskapsakademien. Professor Bo Sundqvist: *Arvid G. Högbom, landhöjningen och hembygden.* Beijersalen, Kungl. Vetenskapsakademien, Lilla Frescativägen 4A, Stockholm. Se sidan 9.

Fortsättning på nästa sida.

Seminarier (fortsättning)

Fr 06–12 kl. 10.00 – 11.00. Öppen föreläsning om risk i försäkringsbranschen. Karel van Hulle, Head of Insurance and Pensions, Internal Market and Services, European Commission: *Solvency II: a new and modern solvency regime for the insurance industry.* Sal E2, KTH, Lindstedtsvägen 3, b.v. Se sidan 14.

Fr 06–12 kl. 14.00. Seminar in Fluid Mechanics. *(Observera dagen, tiden och lokalen!)* **Kunihiko Taira,** Princeton University: *Simulation and control of flows around low-aspect-ratio wings.* Sal E53, KTH, Osquars Backe 14, 2 tr. Se sidan 16.

Money, jobs: Se sidorna 16 – 17.

SEMINARIUM I FINANSIELL MATEMATIK

Niklas Westermark

presenterar sitt examensarbete på grundnivå:

Barrier Option Pricing

Abstract: This thesis examines the performance of five option pricing models with respect to the pricing of barrier options. The models include the Black-Scholes model and four stochastic volatility models ranging from the single-factor stochastic volatility model first proposed by Heston (1993) to a multi-factor stochastic volatility model with jumps in the spot price process. The stochastic volatility models are calibrated using four different loss functions to examine the loss functions effect on the resulting barrier option prices. Our results show that the Black-Scholes model yields significantly different prices, compared with the stochastic volatility models for barriers far from the current spot price. The prices of the four stochastic volatility models are, however, very similar. We also show that the choice of loss function for parameter estimation has little effect on the obtained barrier option prices.

Tid och plats: Måndagen den 1 juni kl. 15.15 – 16.00 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

LOGIKSEMINARIET STOCKHOLM-UPPSALA — PRESENTATION AV EXAMENSARBETE I MATEMATIK

Fredrik Nordvall Forsberg:
Constructive aspects of models for non-standard analysis

Abstract: Reduced products are generalizations of ultraproducts where the filter used need not be an ultrafilter. With a suitable choice of filter, we can then get a more constructive model of non-standard analysis. We study properties of such reduced products and investigate what classical results are still valid in a constructive setting. We will also consider a non-constructive principle called BD, introduced by Hajime Ishihara, as it comes up as a Brouwerian counterexample multiple times during our investigation.

Tid och plats: Onsdagen den 3 juni kl. 9.30 i sal Å11167, Ångströmlaboratoriet, Uppsala universitet.

SEMINARIUM I FINANSIELL MATEMATIK

Tetiana Soviak

presenterar sitt examensarbete:

Financial outcomes of investing into socially responsible companies

Abstract: Preserving a good environmental situation is one of the most important tasks of modern society. That is why a large body of research studies the impact of socially responsible investment strategies on portfolio performance. However, the conclusions drawn from these studies are contradictory and inconsistent.

The aim of this work is to investigate whether a long-term premium or penalty exists for holding environmentally and socially responsible companies in a portfolio. In contrast to all previous studies that were based on market-capitalization indexes, we perform an analysis based on both market-capitalization and Research Affiliates Fundamental® Indexes. The main conclusion of this study is that the results are heavily dependent on portfolio selection, i.e. the way we define environmentally and socially 'friendly' portfolios. In many cases there is no superior investment strategy, since although some may lead to higher returns with higher risk, others are more suitable for risk-averse investors. One limitation of this study is its short performance history (4.5 years), which makes it impossible to draw any conclusions that are statistically significant.

Tid och plats: Måndagen den 1 juni kl. 16.15 – 17.00 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

INSTITUT MITTAG-LEFFLER SEMINAR

Gil Kalai: Noise sensitivity

Abstract: The notion of noise sensitivity of Boolean functions was defined in a paper by Benjamini, Kalai, and Schramm (1999). A closely related notion was considered by Tsirelson and Vershik (1998). I will describe the notion of noise sensitivity of Boolean functions and some basic results and problems related to it. A fun way to explain it (especially after 2000) is in terms of the probability that small mistakes in counting the votes in an election will change the outcome. We will consider the following:

1) The definition of noise sensitivity, and how it is described in terms of the Fourier transform.

2) Noise sensitivity of the crossing event in percolation (BKS 99, Schramm and Steiff 2005, and finally Garban, Pete, Schramm 2008, http://front.math.ucdavis.edu/0803.3750), the scaling limit for the spectral distribution (Schramm and Smirnov, 2007, GPS 2008), and dynamic percolation (ScSt (2005), GPS (2008)). Other cases of noise sensitivity.

3) Noise stability of the majority function, of weighted majority. A conjecture regarding the situation for functions described by monotone depth monotone threshold circuits.

4) The "majority is stablest" theorem (Mossel, O'Donnell, Oleszkiewicz 05, http://front.math.ucdavis.edu/0503.5503) and the connection to hardness of approximation.

We may also proceed to talk about a recent paper by Sourav Chatterjee, http://front.math.ucdavis.edu/0810.4221, entitled "Chaos, concentration, and multiple valleys", which among many other things brings the noise sensitivity story to various unexpected places.

Tid och plats: Torsdagen den 4 juni kl. 14.00 – 15.00 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

DNA-SEMINARIET UPPSALA-KTH (DYNAMICAL SYSTEMS, NUMBER THEORY, ANALYSIS)

Tom Sanders:
Modelling Roth's theorem on three term arithmetic progressions

Abstract: A beautiful theorem of K. F. Roth from the 1950's asserts that any subset of the integers containing no three-term arithmetic progressions with non-zero common difference has density zero.

In the 1980's and 1990's a beautiful model problem was considered: Suppose that $A \subset (\mathbb{Z}/3\mathbb{Z})^n$ contains no affine line. Then $|A| = O(3^n/n)$. A proof of this result (due to Meshulam) can be seen as a finite field version of Roth's proof of his aforementioned theorem, and in this setting the argument becomes much simpler. Despite this, no improvement is known and any bound of the shape $o(3^n/n)$ would be of considerable interest. In this talk we shall consider the analogous problem for $(\mathbb{Z}/4\mathbb{Z})^n$, where an improvement over Roth's argument is possible.

Tid och plats: Tisdagen den 2 juni kl. 13.15 – 14.15 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

INSTITUT MITTAG-LEFFLER SEMINAR

Bálint Tóth:
Long time asymptotics of self-repelling random walks

Abstract: After a short survey of older results I will present recent ones on the diffusivity of self-repelling random walks. In $d = 1$, $d = 2$ and $d > 2$, these walks show very different scaling behaviour.

Tid och plats: Tisdagen den 2 juni kl. 14.00 – 15.00 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

PLURIKOMPLEXA SEMINARIET

Robert Berman:
Sharp inequalities for determinants of Toeplitz operators and $\overline{\partial}$-Laplacians

Abstract: In this talk I will discuss a result concerning sharp inequalities for determinants of Toeplitz operators and twisted $\overline{\partial}$-Laplace operators on the two-sphere, generalizing the Moser-Trudinger-Onofri inequality. In particular, this proves a sharp version of conjectures of Gillet-Soulé and Fang motivated by Arithmetic (Arakelov) geometry. The inequalities are obtained as corollaries of a general theorem about the maximizers of a certain non-local functional defined on the space of all positively curved Hermitian metrics on an ample line bundle over a Kähler manifold. This approach also yields a new proof of the uniqueness (modulo automorphisms) of Kähler-Einstein metrics on Fano manifolds, first shown by Bando-Mabuchi.

Tid och plats: Torsdagen den 4 juni kl. 13.15 i rum 306, hus 6, Matematiska institutionen, SU, Kräftriket.

INSTITUT MITTAG-LEFFLER SEMINAR

Gabor Pete:
The scaling limits of dynamical and near-critical percolation, and the Minimal Spanning Tree

Abstract: Let each site of the triangular lattice, with small mesh η, have an independent Poisson clock with a certain rate $r(\eta) = \eta^{3/4+o(1)}$ switching between open and closed. Then, at any given moment, the configuration is just critical percolation; in particular, the probability of a left-right open crossing in the unit square is close to 1/2. Furthermore, because of the scaling, the expected number of switches in unit time between having a crossing or not is of unit order.

We prove that the limit (as $\eta \to 0$) of the above process exists as a Markov process, and it is conformally covariant: if we change the domain with a conformal map $\phi(z)$, then time scales locally by $|\phi'(z)|^{3/4}$. The same proof yields a similar result for near-critical percolation, and it also shows that the scaling limit of (a version of) the Minimal Spanning Tree exists, it is invariant under translations, rotations and scaling, but *probably* not under general conformal maps.

The talk is based on joint work with Christophe Garban and Oded Schramm.

Tid och plats: Tisdagen den 2 juni kl. 15.30 – 16.30 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

PRESENTATION AV EXAMENSARBETE I MATEMATIK

Maya Brandi:
Mönstersökning — en gradientrelaterad metod

Handledare: **Yishao Zhou.**

Sammanfattning: Direkta sökmetoder är en grupp optimeringsmetoder som karakteriseras av att de aldrig använder någon gradientbaserad information i sökandet efter en optimal punkt. Vi kommer att koncentrera oss på optimeringsproblemet att utan bivillkor hitta ett lokalt minimum till en funktion f i $\mathbb{R}^n$. Inom den gradientbaserade optimeringen löser man den här typen av problem genom att utifrån en punkt x_0 med gradientens hjälp hitta avtagande riktningar att successivt söka längs med. En direkt sökmetod testar i stället längs (som minst) n linjärt oberoende riktningar för att se om någon av dessa reducerar värdet på målfunktionen. Vi kommer att titta på en gren av de direkta sökmetoderna som kallas mönstersökning och som i huvudsak karakteriseras av att sökriktningar och steglängd är konstruerade på ett sådant sätt att varje genererad punkt hamnar på ett av f oberoende lattice.

Frånvaron av gradientinformation har gjort det svårt att utveckla konvergensbevis för de direkta sökmetoderna. År 1997 kom ett generellt bevis för mönstersökningsmetoderna, och nyckeln till beviset är just deras egenskap att generera punkter på ett av f oberoende lattice. Vi kommer att studera mönstersökningsmetodernas struktur, dels genom några exempel och dels på generaliserad form och vi kommer att gå igenom konvergensbeviset för den generaliserade mönstersökningsmetoden, utvecklat 1997 av Virginia Torczon.

Tid och plats: Onsdagen den 3 juni kl. 11.15 – 12.15 i sal 21, hus 5, Matematiska institutionen, SU, Kräftriket.

PRESENTATION AV EXAMENSARBETE I MATEMATIK

Ulrica Gustafsson:
Modellering av reaktioner i en lösning innehållande proteinmolekyler och metalljoner

Handledare: **Hans Rullgård.**

Sammanfattning: En lösning innehåller proteinmolekyler och metalljoner som reagerar med varandra. Vi bygger upp ett system av differentialekvationer som matematiskt beskriver de reaktioner som sker. Genom att förenkla detta system lyckas vi skapa en modell som beskriver reaktionsförloppet. Modellen möjliggör en kvantitativ tolkning av experimentella data och bestämning av flera reaktionskonstanter.

Tid och plats: Onsdagen den 3 juni kl. 10.00 – 11.00 i sal 21, hus 5, Matematiska institutionen, SU, Kräftriket.

KOMBINATORIKSEMINARIUM

Gil Kalai:
A mathematical dialogue in Discrete Geometry with Jürgen Eckhoff

Abstract: Over the last three decades I am having a sort of mathematical dialogue with Jürgen Eckhoff and I will devote the lecture to mention some of its highlights.

1) In 1980 both Eckhoff and I proved by different methods an "upper bound conjecture" of Katchalski and Perles.

2) In 1983 I proved a conjecture of Eckhoff giving a complete description of f-vectors of nerves of families of convex sets in Euclidean spaces.

3) In 1988 Eckhoff proved a conjecture of mine regarding families of standard boxes in Euclidean spaces.

4) Around 1990 we both formulated separately a conjecture on face numbers of flag complexes (number of complete subgraphs of various sizes of a graph), which was proved in 2005 by Andy Frohmader. Frohmader's theorem asserts that the f-vector of a clique complex (the complex of complete subgraph of a graph) (aka as "flag complex") of dimension d is the f-vector of some d-coloured simplicial complex. This is a far-reaching extension of Turan's theorem.

5) In 2006 Meshulam and I proved a result about homological dimensions of projections of simplicial complexes, which implies a topological version of a Helly type theorem by Amenta. In the same year Eckhoff and Klaus-Peter Nischke proved a far-reaching combinatorial extension of Amenta's theorem first offered by Morris. Their result also implies the same topological extension of Amenta's theorem.

6) Eckhoff and I proposed in the mid 1970s (different) far-reaching extensions of Tverberg's theorem. Both are still open.

There are other points: The work of Björner and me on face numbers and Betti numbers of cell complexes is closely related to earlier works by Eckhoff and Wegner on the Kruskal-Katona theorem. The work by Alon and me on (p, q) theorems for hyperplane transversals is also strongly related to earlier works by Eckhoff.

Tid och plats: Onsdagen den 3 juni kl. 10.15 – 11.15 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

PRESENTATION AV EXAMENSARBETE I MATEMATIK

Martin Strömqvist:
The Newtonian potential obstacle problem in perforated domains

Abstract: My thesis deals with homogenization of a particular obstacle type problem, the obstacle being a Newtonian potential. The Newtonian potential is induced by a measure defined on a perforated domain. As the perforations are being more and more densely distributed, the perforated measure converges weakly to a limit measure, and the sequence of solutions to the obstacle problem converges uniformly to the solution of a limit obstacle problem.

Tid och plats: Onsdagen den 3 juni kl. 10.00 – 11.00 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

ALGEBRA AND GEOMETRY SEMINAR

Håkan Granath:
Explicit rational models of Shimura curves

Abstract: Shimura curves are moduli spaces of abelian surfaces with quaternionic multiplication (QM). The arithmetic of QM abelian surfaces is closely related to the arithmetic of elliptic curves, but so far largely unexplored. In this talk, we will describe examples of explicit canonical rational models of Shimura curve, and examine some of their basic properties. As an application we prove the result that any rational genus 2 curve with QM by the maximal quaternion order with discriminant 6, and potentially smooth reduction at 2 and 3, has infinitely many supersingular primes.

Tid och plats: Onsdagen den 3 juni kl. 13.15 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

OFFENTLIG FÖRELÄSNING PÅ KUNGL. VETENSKAPSAKADEMIEN

Bo Sundqvist:
Arvid G. Högbom, landhöjningen och hembygden

Talare: Professor Bo Sundqvist är förutvarande rektor vid Uppsala universitet, ledamot av Kungl. Vetenskapsakademiens klass för fysik, och akademiens preses 2006 – 2009.

Sammanfattning: Föredraget kommer att handla om hur man studerat och förklarat landhöjningen genom tiderna. Bo Sundqvist har gjort en del egna studier och träffat på en verklig akademisk profil i sammanhanget från sin egen hembygd, Lövångers församling i Västerbotten, nämligen Arvid G. Högbom. Högbom var en betydelsefull forskare inom många områden och var sannolikt den som satte Svante Arrhenius på spåren vad gäller växthuseffekten. Som tidigare ledamot av akademien hedrades han på 1950-talet med en minnesföreläsning.

Tid och plats: Onsdagen den 10 juni kl. 18.00 – 19.00 i Beijersalen, Kungl. Vetenskapsakademien, Lilla Frescativägen 4A, Stockholm.

LICENTIATSEMINARIUM I MATEMATIK

Qimh Xantcha

presenterar sin licentiatavhandling:

Polynomiality

Opponent: **Professor Volodymyr Mazorchuk,** Uppsala universitet.

Abstract: The question of polynomiality for maps and functors of abelian groups (not additive ones, obviously) was first addressed by Eilenberg and Mac Lane in 1954. We extend this notion to modules over numerical rings, which are rings equipped with binomial coefficients, presumably first discovered by Torsten Ekedahl in 2002. These rings turn out to present an array of rather pleasant properties, some of which may come somewhat as a surprise.

After having discussed the elementary properties of numerical rings, we turn to different notions of polynomiality for maps and functors of modules. Strict and non-strict polynomiality are two concepts that have classically been rent asunder by their inherently different natures, but the setting of numerical rings allows for a beautiful unification of the two.

An intricate design of ours is the labyrinth category, and we shall explain how it yields a complete combinatorial description of *all* module functors over an *arbitrary* base ring, as evidenced by the exquisite equation

$$\mathfrak{Fun}(\mathfrak{XMod}, \mathfrak{Mod}) \sim \mathfrak{Fun}(\mathfrak{Laby}, \mathfrak{Mod}).$$

Tid och plats: Torsdagen den 4 juni kl. 10.00 i rum 306 (Cramérrummet), hus 6, Matematiska institutionen, SU, Kräftriket.

LICENTIATSEMINARIUM I STATISTIK

Cletus Kum Kwa

lägger fram sin licentiatavhandling:

Bayesian Analysis of Two Malaria Treatments and Probability Modelling of Malaria Parasite Genotypes

Diskutant: **Docent Martin Sköld,** Örebro universitet.

Abstract: We analyse data from a two-centre study of malaria treatment of children in Tanzania from two aspects. The efficacy of two drugs is evaluated using Bayesian statistical methods. Simple models on the curative ability as well as the ability to delay reinfection are formulated and the posterior distributions are obtained. The drug in combination with artemisinin-derivative is seen to be a better treatment regimen. These results confirm existing knowledge that Plasmodium falciparum offers less resistance to Artemisinin Combination Therapy. Probability models are formulated to estimate the probability of infections with one or several types of genotyped malaria parasites. We study three genes which are suspected to exist in two forms: susceptible and resistant. One of the susceptible genes is affected much while for another locus, the ratio between susceptible and resistant is not affected. Separate models at baseline, first instance of reinfection and at both time points are considered. The superior models that provide a better fit to data are used to measure the effects of treatment on parasite in the genotypes.

Tid och plats: Torsdagen den 4 juni kl. 10.00 i sal B705, Statistiska institutionen, SU, Universitetsvägen 10B, plan 7, Frescati.

MINIWORKSHOP IN PDE AND POTENTIAL THEORY

The workshop will take place at the Department of Mathematics, Stockholm University, on Thursday, June 4, 2009, in room 306, house 6, Kräftriket.

Schedule

10.00 – 10.50 **Antoine Mellet,** University of Maryland: *Random homogenization of Hele-Shaw and Stefan problems.*

Abstract: It is a well-known fact that Hele-Shaw and Stefan free boundary problems can be formally formulated as obstacle problems via an integration in time. Using the notion of viscosity solutions, we make this connection more rigorous. We then deduce some results on the periodic and random homogenization of Hele-Shaw and Stefan free boundary problems, when oscillations arise along the free boundary. This is a joint work with Inwon Kim.

11.00 – 11.50 **Régis Monneau,** CERMICS: *Pointwise estimates for the obstacle problem.*

Abstract: We present pointwise regularity results for solutions to elliptic equations. A typical result is that if the modulus of mean oscillation of Δu at the origin is Dini (in L^p average), then the origin is a Lebesgue point of continuity (still in L^p average) for the second derivatives D^2u. We extend this pointwise regularity result to the obstacle problem for the Laplace equation with Dini right hand side at the origin. Our method of proof is based on some decay estimates obtained by contradiction, using blow-up arguments and Liouville Theorems. In the case of singular points of the free boundary, our method uses moreover a refined monotonicity formula.

11.50 – 13.30 Lunch.

13.30 – 14.20 **Lionel Levine,** MIT: *Obstacle problems and lattice growth models.*

Abstract: Start with n particles at each of k points in the integer lattice Z^d, and let each particle perform simple random walk until it reaches an unoccupied site. We relate this growth process to an obstacle problem for the discrete Laplacian, and prove that if the distances between the starting points are scaled by $n^{1/d}$, then the set of occupied sites has a deterministic scaling limit. The limiting shape is a classical quadrature domain in the sense of Aharonov and Shapiro. I will also discuss a sandpile model that arises from adding an integrality constraint to the obstacle problem, which produces beautiful examples of pattern formation that are not yet well understood. The talk is based on joint work with Yuval Peres.

14.30 – 15.20 **Andrzej Szulkin,** SU: *On the Brézis-Nirenberg problem with critical exponent.*

Abstract: In a celebrated paper from 1983 Brézis and Nirenberg have shown that if $\Omega \subset \mathbb{R}^N$ is a bounded domain and λ_1 is the first Dirichlet eigenvalue for $-\Delta$ in Ω, then the boundary value problem $-\Delta u = \lambda u + u^{2^*-1}$ in Ω, $u|_{\partial\Omega} = 0$, has a solution $u > 0$ whenever $0 < \lambda < \lambda_1$ and $N \geq 4$. Here $2^* := 2N/(N-2)$ is the critical exponent with respect to the Sobolev embedding $H_0^1(\Omega) \hookrightarrow L^p(\Omega)$. The purpose of this talk is to review some old and new results related to this problem.

Welcome!

Sara Maad Henrik Shahgholian Andrzej Szulkin

ALGEBRA AND GEOMETRY SEMINAR

René Birkner:
Incoherent components of the Toric Hilbert Scheme

Abstract: The classical Hilbert scheme is the scheme whose closed points are all subschemes of $\mathbb{P}^n$ with the same Hilbert function. That is, for $S = k[x_0, \ldots, x_n]$ and an ideal $I \subset S$ the function $H(t) = \dim_k(S/I)_t$ whose value at d is the dimension over k of the degree t part of S/I. Endowing the ring S with a multigrading, i.e. the degree of x_i is $a_i \in \mathbb{Z}^d$, we construct the multigraded Hilbert function. This is the analogon to the classical Hilbert function with degrees in $\mathbb{Z}^d$ for some $d > 0$. Then one can consider all ideals $I \subset S$ with the same multigraded Hilbert function, these are the closed points of the multigraded Hilbert scheme. We consider the simplest case, taking the semigroup $\mathbb{N}\mathcal{A} = \left\{\sum n_i a_i \,|\, n_i \in \mathbb{N}\right\}$ and the multigraded Hilbert function

$$\dim(S/I)_a = \begin{cases} 1 & \text{for } a \in \mathbb{N}\mathcal{A}, \\ 0 & \text{otherwise.} \end{cases}$$

This gives a so-called Toric Hilbert Scheme. This turns out to have many interesting properties, of which some will be presented in the talk.

Tid och plats: Torsdagen den 4 juni kl. 13.15 – 14.15 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

DISPUTATION I MATEMATIK

Lisa Nilsson

skall disputera på avhandlingen

Amoebas, Discriminants, and Hypergeometric Functions

fredagen den 5 juni 2009 kl. 13.00 i sal 14, hus 5, Matematiska institutionen, SU, Kräftriket. Till opponent har utsetts *professor Maurice Rojas,* Department of Mathematics, Texas A & M University.

Abstract of the thesis

This thesis consists of six chapters. In Chapter 1 we give some historical background to the topic of the thesis together with the fundamental definitions and results that the thesis is based on.

In Chapter 2 we study Mellin transforms of rational functions and investigate their analytic continuations. The main result in this chapter is a full description of the polar locus of the meromorphic continuation of the Mellin transform. It turns out to be closely connected with the Newton polytope of the denominator f of the rational function. We also relate the Mellin transforms to the coamoeba of the polynomial f. In fact, we represent the function $1/f$ as an inverse Mellin transform converging on the complement of the coamoeba $\mathcal{A}'_f$. This is in analogy with the Laurent series expansions of $1/f$ which are known to converge on the complement of the amoeba $\mathcal{A}_f$.

In Chapter 3 we study the general structure and properties of two-dimensional discriminantal coamoebas. We prove that such a coamoeba is the union of two mirror images of a polygonal curve simply obtained from the matrix B in the Horn-Kapranov parametrization. We provide an area formula for the coamoeba, and show that the coamoeba is intimately related to a certain zonotope. In fact, considering the coamoeba and the zonotope as chains projected on the torus $(\mathbb{R}/2\pi\mathbb{Z})^2$, the summed chain obtained as the union of the coamoeba and the zonotope is a 2-cycle, and as such, is an integer multiple of the torus itself.

(Continued on the next page.)

The last three chapters deal with hypergeometric functions, again in connection with amoeba theory. We study A-hypergeometric functions in the form of power series, and analytic continuations given by integrals of Mellin-Barnes type. We also introduce a related Γ-integral, which is more suitable as a continuous version of the Γ-series. We prove theorems describing the domains of convergence for A-hypergeometric series and for the associated Mellin-Barnes type integrals, as well as for the Γ-integrals. The exact description of the convergence domains is given in terms of the complement components of discriminantal amoebas for the series, whereas in the case of the integrals they are given as zonotopes. By the results in Chapter 3, we know (for two dimensions) that these zonotopes exactly cover the complement of the coamoeba the correct number of times in order to get a complete basis of hypergeometric integrals.

INSTITUT MITTAG-LEFFLER SEMINAR

Svante Janson: Audience's choice

Abstract: I will let the audience choose between three different subjects that I have been working on recently.

Tid och plats: Torsdagen den 4 juni kl. 15.30 – 16.30 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

DISPUTATION I MATEMATIK

Erik Lindgren

skall disputera på avhandlingen

Regularity properties of two-phase free boundary problems

fredagen den 5 juni 2009 kl. 14.00 i sal F3, KTH, Lindstedtsvägen 26, b.v. Till opponent har utsetts *professor Régis Monneau,* CERMICS-ENPC, Frankrike.

Abstract of the thesis

This thesis consists of four papers which are all related to the regularity properties of free boundary problems. The problems considered have in common that they have some sort of two-phase behaviour.

In papers I – III we study the interior regularity of different two-phase free boundary problems. Paper I is mainly concerned with the regularity properties of the free boundary, while in papers II and III we devote our study to the regularity of the function, but as a by-product we obtain some partial regularity of the free boundary.

The problem considered in paper IV has a somewhat different nature. Here we are interested in certain approximations of the obstacle problem. Two major differences are that we study regularity properties close to the fixed boundary and that the problem converges to a one-phase free boundary problem.

EUROPEISKA FORSKNINGS- OCH UTVECKLINGSPROGRAM — EN PRESENTATION

Tid och plats: Onsdagen den 10 juni kl. 11.30 – 16.00 på KTH, Lindstedtsvägen 5, i ljusgården, sal D3, m.fl. salar.

KTH, Vetenskapsrådet och VINNOVA välkomnar dig till en informationsdag om möjligheterna att söka finansiering inom de europeiska forsknings- och utvecklingsprogrammen (FoU). Du får senaste nytt om kommande utlysningar inom det sjunde ramprogrammet, FP7! Under sommaren och hösten 2009 öppnar utlysningar inom alla tematiska områden inom FP7. Dessutom finns det möjlighet att söka finansiering via ERC, People, Capacities, COST, EUREKA och Eurostars. Totalt handlar det om cirka 45 miljarder kronor som står till förfogande för europeisk FoU. Denna informationsdag ger tillfälle att upptäcka nya möjligheter inom de europeiska forskningsprogrammen för dig som är forskare vid företag, myndighet, institut eller universitet. Presentationerna är baserade på engelskt material men hålls på svenska.

Questions can be addressed in both English and Swedish.

Dagen är kostnadsfri och vi bjuder på lunchsmörgås och kaffe.

Anmäl dig senast onsdagen den 3 juni till Marina Backer Skaar, KTH Grants Office, backer@kth.se.

Observera: Antalet platser är begränsat!

Deltagande: NCP (National Contact Points) från VINNOVA: Johan Lindberg, Gunnar Sandberg, Monica Hjertman, Britta Fängström, Ciro Vasquez, Mårten Jansson, Bengt Nilsson, Birgitta Boman samt Ana Beremendi från Vetenskapsrådet.

Ett detaljerat program för informationsdagen finns på följande adress: http://www.europaprogrammen.se/upload/Infodagar/Informationsturne%2009/Program_KTH_.pdf.

Välkommen!

ÖPPEN FÖRELÄSNING OM RISK I FÖRSÄKRINGSBRANSCHEN

Karel van Hulle: Solvency II: a new and modern solvency regime for the insurance industry

Speaker: Karel van Hulle is a lawyer by training and is Head of Unit at the European Commission (Directorate-General "Internal Market and Services"), which he joined in 1984 after having served 8 years with the Belgian Banking Commission.

He was subsequently Head of Unit for Accounting Standards, Head of Unit for Financial Reporting and Company Law and Head of Unit for Accounting and Auditing. In that capacity he was closely involved with harmonization in the fields of accounting, auditing, and company law both at EU level and internationally and served as the Commission's observer with the International Accounting Standards Committee. He was Secretary of the High Level Group of Experts on Company Law which prepared the Commission's 2003 Action Plan on Company Law. Since November 2004, he has been Head of the Insurance and Pensions Unit. In his present function, his main responsibility is the preparation of a new solvency regime for insurance and reinsurance companies (Solvency II).

Tid och plats: Fredagen den 12 juni kl. 10.00 – 11.00 i sal E2, KTH, Lindstedtsvägen 3, b.v.

DISPUTATION I OPTIMERINGSLÄRA OCH SYSTEMTEORI

Yohei Kuroiwa

skall disputera på avhandlingen

A Parameterization of Positive Real Residue Interpolants with McMillan Degree Constraint

fredagen den 12 juni 2009 kl. 10.00 i sal D1, KTH, Lindstedtsvägen 17, 3 tr. Till opponent har utsetts *professor György Michaletzky,* Eötvös Loránd University, Budapest.

Abstract of the thesis

The main body of this thesis consists of six appended papers. The papers are about the theory of the positive real interpolation with McMillan degree constraint.

In Paper A, a parameterization of the positive real residue interpolants with McMillan degree constraint is given. For given interpolation data and for each free parameter, a positive real interpolant, of which McMillan degree is equal to the McMillan degree of the maximum entropy interpolant, is obtained by solving a nonlinear equation, which is homotopic to a nonlinear equation to determine the maximum entropy interpolant.

In Paper B, the state-space realization of the multivariate rational interpolant with bounded McMillan degree is given by the block discrete-time Schwarz form. A characterization of the positive realness of the block discrete-time Schwarz form is given by a linear matrix inequality.

In Paper C, a robust controller synthesis for the mismatch of delay in terms of the Nevanlinna-Pick interpolation is presented.

In Paper D, a Smith predictor synthesis for unstable and minimum-phase input delay system and for a first order unstable distributed delay system is given in terms of the Nevanlinna-Pick interpolation.

In Paper E, we study an approximation of spectral density in terms of the generalized Kullback-Leibler distance minimization. For a given spectral density, we seek a spectral density by minimizing the generalized Kullback-Leibler distance subject to a constraint on the tangential second-order statistics.

In Paper F, a property of Schur polynomial of real coefficients and real Toeplitz matrix is given. Suppose that the vector of coefficients of a Schur polynomial annihilates a Toeplitz matrix, then the Toeplitz matrix is in fact a zero matrix.

BELÖNINGAR TILL KTH-MATEMATIKER

Styrelsen för Göran Gustafssons Stiftelse har beslutat att *Kristian Bjerklöv, Michelle Bucher-Karlsson, Axel Hultman* och *Maria Saprykina,* alla verksamma vid Institutionen för matematik, KTH, skall få det mindre Gustafssonpriset till yngre forskare. De får vardera ett forskningsanslag om 300 000 kr.

Vi framför våra gratulationer till mottagarna!

SEMINAR IN FLUID MECHANICS

Kunihiko Taira:
Simulation and control of flows around low-aspect-ratio wings

Abstract: There is increasing interest in the deployment of small-scale unmanned aircraft, known as the Micro Air Vehicles (MAVs), for military and civilian missions. However, the three-dimensional flow physics around such vehicles has not been well understood compared to the classical high-Reynolds-number aerodynamics for conventional aircraft. To offer fundamental understanding of the flow field around the MAVs, a new formulation of the immersed boundary method is developed and used to perform three-dimensional flow simulations around low-aspect-ratio wings at low Reynolds numbers. The study highlights the vortex dynamics in the wake for various low-aspect-ratio wings over a wide range of angles of attack. Relatively strong wind gusts and agile manœuvres often cause flow to separate on the wings of MAVs. Inspired by how flapping insect wings benefit from unsteady separated flows, active flow control is introduced to increase lift by modifying the three-dimensional dynamics of the wake vortices behind purely translating wings. This approach exploits the nature of separated flows and is different from the conventional control efforts that focus on flow reattachment. Successful control setups that achieve lift enhancement by a factor of two in post-stall flows for low-aspect-ratio wings will be presented.

Tid och plats: Fredagen den 12 juni kl. 14.00 i sal E53, KTH, Osquars Backe 14, 2 tr.

MONEY, JOBS

Columnist: Johannes Lundqvist, Department of Mathematics, Stockholm University. E-mail: johannes@math.su.se.

Info = information. This will be given and repeated until obsolete. Rely on other sources as well.
BBKTH = Bulletin Board at the Department of Mathematics, KTH.
BBSU = Bulletin Board at the Department of Mathematics, SU.
The following information, with links, is also available at http://www2.math.su.se/~johannes/mj.html.
Unless stated otherwise, a given date is the last date (e.g. for applications), and the year is 2009. A number without an explanation is a telephone number.

Standard information channels

1. A channel to information from Vetenskapsrådet: http://www.vr.se/naturteknik/index.asp.
2. A channel to information from the European Mathematical Society: http://www.emis.de.
3. A channel to information from the American Mathematical Society: http://www.ams.org.
4. KTH site for information on funds: http://www.kth.se/aktuellt/stipendier.
5. Stockholm University site for information on funds: http://www2.su.se/forskning/stipendier/databas.php3.
6. Umeå site for information on funds: http://www.umu.se/umu/aktuellt/stipendier_fond_anslag.html.
7. Job announcement site: http://www.maths.lth.se/nordic/Euro-Math-Job.html. This is run by the European Mathematical Society.
8. Stiftelsen för internationalisering av högre utbildning och forskning (STINT) site for information on funds: http://www.stint.se.
9. Nordisk Forskerutdanningsakademi (NorFA) site for information on funds: http://www.norfa.no.
10. Svenska institutet (SI) site for information on funds: http://www.si.se.

New information

Jobs to apply for

11. Linköpings universitet söker en doktorand i matematik. Sista ansökningsdag är den 12 juni. Web-info: http://www.liu.se/jobbdb/show.html?2977.

(Continued on the next page.)

12. Örebro universitet söker en universitetslektor i matematik med inriktning mot tillämpad matematik. Sista ansökningsdag är den 17 augusti. Web-info: http://www.oru.se/templates/oruextAdViewer.aspx?id=2303&adPageID=58674.
13. Norges teknisk-naturvitenskapelige universitet (NTNU) i Trondheim söker en "førsteamanuensis" (associate professor) i algebra. Sista ansökningsdag är den 9 juni. Web-info: http://www.math.ntnu.no/~oyvinso/algebra-position-2009.pdf.
14. Linköpings universitet söker en universitetslektor i tillämpad matematik. Sista ansökningsdag är den 24 juni. Web-info: http://www.liu.se/jobbdb/show.html?2962.
15. Linköpings universitet söker en universitetslektor i matematikdidaktik. Sista ansökningsdag är den 12 juni. Web-info: http://www.liu.se/jobbdb/show.html?2954.

Old information

Money to apply for

16. Stiftelsen P. E. Lindahls fond utlyser två stipendier om vartdera 100 000 kr för studier inom de naturvetenskapliga ämnena. Tidigare har prioritering givits till nydisputerade forskare samt till seniora forskare som är i behov av bidrag till fortsatt utbildning, exempelvis i form av resa till eller vistelse vid annat universitet. Sista ansökningsdag är den 31 augusti. Web-info: http://www.kva.se/KVA_Root/swe/awards/scholarships/detail_scholarships.asp?grantsId=15.

Jobs to apply for

17. Chalmers tekniska högskola ledigförklarar tillsammans med Göteborgs universitet och Karolinska Institutet en "postdoctoral position in the field of mathematical modelling and numerical analysis for radiation particle transport". Sista ansökningsdag är den 1 juni. Web-info: http://www.chalmers.se/math/EN/news/vacancies/positions/post-doctoral-position.
18. Lunds universitet söker en biträdande universitetslektor (associate senior lecturer) i matematisk statistik med inriktning mot statistiska metoder och modeller inom biologi och medicin. Sista ansökningsdag är den 31 juli. Web-info: http://www3.lu.se/info/lediga/admin/document/PA2009-1148.pdf.