# BRÅKET

*Information om seminarier och högre undervisning i matematiska ämnen i Stockholmsområdet*

**NR 34** **FREDAGEN DEN 29 OKTOBER 2004**



**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 november kl. 13.00.


## SEMINARIER

**Fr 10–29 kl. 10.00–12.00. Högre seminarium i språkfilosofi och logik. Dag Westerståhl:** *On the logicality and constancy of logical constants.* Rum D700, Filosofiska institutionen, SU. Se sidan 5.

**Fr 10–29 kl. 13.00–14.00. Presentation av examensarbete i matematik. Gustaf Sparreman:** *Theory of deterministic and stochastic Riccati differential equation with numerical aspects.* Sal 16, hus 5, Matematiska institutionen, SU, Kräftriket. Se Bråket nr 33 sidan 3.

**Fr 10–29 kl. 13.00–15.00. Seminar on Etale Cohomology. Wojciech Chacholski:** *Henselian rings.* (Fortsättning från seminariet den 15 oktober.) Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

**Fr 10–29 kl. 15.15. Google-föredrag. Magnus Sandberg,** Senior Software Engineer, Google Switzerland: *Finding needles in a 50TB haystack: Building scalable systems for web search and beyond.* Sal E1, KTH, Lindstedtsvägen 3, entréplanet. Se Bråket nr 32 sidan 5.

**Fortsättning på nästa sida.**

## SEMINARIUM I ANALYS OCH DYNAMISKA SYSTEM

### Ignacio Uriarte-Tuero: On Marcinkiewicz integrals and harmonic measure

*Abstract:* Jones and Makarov gave sharp density estimates for harmonic measure using a modified version of Marcinkiewicz integrals called $\tilde{I}_0$. It was also used by Jones and Smirnov to substantially advance in the Sobolev and quasiconformal removability problems. We generalize and slightly change $\tilde{I}_0$ to make it account for different densities of sets over which to integrate, in particular giving a different proof than Jones' and Makarov's of its key properties. This should have applications to the aforementioned Sobolev and quasiconformal removability problems.

*Tid och plats:* Onsdagen den 10 november kl. 13.15–14.15 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

**Seminarier (fortsättning)**

**Må 11–01 kl. 14.15 – 15.00. Seminarium i numerisk analys. Hans Riesel,** Nada, KTH: *Förenkling av sammansatta kubikrötter.* Rum 4523, Nada, KTH, Lindstedtsvägen 5, plan 5. Se Bråket nr 33 sidan 1.

**Må 11–01 kl. 15.15 – 16.15. DNA-seminariet Uppsala-KTH (Dynamics, Number theory, and Analysis).** *(Observera tiden!)* **Torbjörn Lundh,** Chalmers tekniska högskola, Göteborg: *DNA has not all the answers.* Sal MIC 2144, Matematiska institutionen, Polacksbacken, Uppsala universitet. Se Bråket nr 33 sidan 4.

**Ti 11–02 kl. 10.15. Plurikomplexa seminariet. Shigeaki Nagamachi,** Tokushima: *Support and kernel theorem for Fourier hyperfunctions.* Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 4.

**Ti 11–02 kl. 13.15. Plurikomplexa seminariet. Torbjörn Lundh,** Chalmers tekniska högskola, Göteborg: *The conical limit set is thinner than the set where the fattened orbit is not minimally thin.* Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 4.

**Ti 11–02 kl. 14.00 – 15.00. Mittag-Leffler Seminar. Damon Wischik,** Trinity College, Cambridge: *The calculus of hurstiness.* Institut Mittag-Leffler, Auravägen 17, Djursholm.

**Ti 11–02 kl. 14.00 – 16.00. Seminar in Statistical Genetics and Bioinformatics. Ph. D. Alexander Ploner,** Institutionen för medicinsk epidemiologi och biostatistik, Karolinska Institutet: *Statistical issues in cancer proteomics.* Rum 306 (Cramérrummet), hus 6, Matematiska institutionen, SU, Kräftriket. Se Bråket nr 33 sidan 5.

**Ti 11–02 kl. 15.30 – 16.30. Mittag-Leffler Seminar. Ryszard Szekli,** Wroclaw University: *Dependence ordering for Markov processes: Queueing networks in view.* Institut Mittag-Leffler, Auravägen 17, Djursholm.

**Ti 11–02 kl. 16.15 – 17.00. Study Group on Zeta Functions in Dynamics and Algebraic Geometry. Anders Karlsson,** KTH: *Heat kernels and zeta functions.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 3.

**On 11–03 kl. 10.15. Mathematical Physics Seminar. Mark Rolinec,** Technische Universität München: *The physics potential of the Beta-beams.* Seminarierummet, Roslagstullsbacken 11, AlbaNova universitetscentrum.

**On 11–03 kl. 13.15. Seminarium i analys och dynamiska system. Benoit Mandelbrot,** Yale: *Recent topics in fractals and multifractals.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

*Observera att Benoit Mandelbrot skall tala vid analysseminariet den 3 november. Serguei Shimorins seminarium har uppskjutits till den 17 november. Se nästa nummer av Bråket.*

**On 11–03 kl. 13.15. Algebraseminarium. Erik Backelin:** *Quantum flag variety, quantum D-modules and localization of quantum groups.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 6.

**Fortsättning på nästa sida.**

**Seminarier (fortsättning)**

**Må 11–08 kl. 18.30. Populärvetenskaplig föreläsning i fysik. Professor Håkan Snellman,** Teoretisk elementarpartikelfysik, KTH: *Det svänger om neutrinerna: Om universums svårfångade partiklar.* Oskar Kleins auditorium, Roslagstullsbacken 21, AlbaNova universitetscentrum. Se sidan 7.

**Ti 11–09 kl. 13.15. Seminar in Theoretical and Applied Mechanics. Karl-Erik Thylwe,** Mekanik, KTH: *Ermakov-Lewis invariants — tools in the Regge-pole analysis of scattering.* Seminarierummet, Institutionen för mekanik, KTH, Teknikringen 8. Se sidan 6.

**Ti 11–09 kl. 14.00 – 16.00. Seminar in Statistical Genetics and Bioinformatics. Docent Arne Elofsson,** Stockholm Bioinformatics Center, SU: *Protein structure and function prediction by automated distant homology detection.* Rum 306 (Cramérrummet), hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 5.

**On 11–10 kl. 13.15 – 14.15. Seminarium i analys och dynamiska system. Ignacio Uriarte-Tuero,** Yale och Helsingfors: *On Marcinkiewicz integrals and harmonic measure.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 1.

**On 11–10 kl. 13.15. Algebraseminarium. Cinzia Casagrande:** *On some numerical properties of Fano varieties.* Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 4.

**On 11–10 kl. 15.30. Seminarium i numerisk analys.** *(Observera dagen, tiden och lokalen!)* **Professor Börje Johansson,** Institutionen för materialvetenskap, KTH: *Atomistic modelling of materials.* Seminarierummet, Parallelldatorcentrum, KTH, Teknikringen 14, plan 3.

**Må 11–15 kl. 15.15 – 17.00. Seminarium i matematisk statistik. Professor Aihua Xia,** Department of Mathematics and Statistics, University of Melbourne: *Stein's method: from Poisson approximation to a discrete central limit theorem.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 7.

*Professor Xia är gäst vid avdelningen för matematisk statistik vid KTH under tiden 15 – 19 november 2004.*

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## STUDY GROUP ON ZETA FUNCTIONS IN DYNAMICS AND ALGEBRAIC GEOMETRY

### Anders Karlsson: Heat kernels and zeta functions

*Abstract:* I will explain the path from heat kernels, via theta inversion formulas, to zeta functions and their functional equations, by illustrating this in some cases. A brief introduction to the Jorgenson-Lang program connected with this on ladders of zeta functions will also be attempted.

*Tid och plats:* Tisdagen den 2 november kl. 16.15 – 17.00 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

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## PLURIKOMPLEXA SEMINARIET

**Shigeaki Nagamachi:**
**Support and kernel theorem for Fourier hyperfunctions**

*Abstract:* There are two main approaches to the theory of Fourier hyperfunctions: the cohomological method (Sato's original method) and the duality method. In the duality method, a Fourier hyperfunction is defined as an element of the dual space of rapidly decreasing holomorphic functions, i.e., a kind of analytic functional. For an analytic functional, the support (the smallest carrier) does not necessarily exist. The existence of the support is one of the most important results in the theory of Fourier hyperfunctions. We use a new method to prove the existence of the support, and, by using this method, prove the kernel theorem for Fourier hyperfunctions.

*Tid och plats:* Tisdagen den 2 november kl. 10.15 i rum 306, hus 6, Matematiska institutionen, SU, Kräftriket.

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## PLURIKOMPLEXA SEMINARIET

**Torbjörn Lundh:**
**The conical limit set is thinner than the set where the fattened orbit is not minimally thin**

*Abstract:* We will discuss a relation between potential theory and discrete groups. To be more specific, we will investigate a connection between the limit set of a discrete group (e.g. Fuchsian or Kleinian) and the concept of minimal thinness. I will give various viewpoints, and examples, introducing (or recalling) these concepts, including a recent result on minimally thin sub-graphs. We will also discuss a solution of a question left open in my thesis whether the conical limit set equals the set where the *fattened* orbit is not minimally thin. The solution is based on a prescribed geodesic on a specific Riemann surface. Finally, we will look at some still open questions.

*Tid och plats:* Tisdagen den 2 november kl. 13.15 i rum 306, hus 6, Matematiska institutionen, SU, Kräftriket.

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## ALGEBRASEMINARIUM

**Cinzia Casagrande:**
**On some numerical properties of Fano varieties**

*Abstract:* Let $X$ be a smooth, complex Fano variety. We will focus on some conjectures on the maximal Picard number that $X$ can have, in terms of its pseudo-index and of its dimension. The approach is the study of families of rational curves in $X$. The second part of the talk will be devoted to the toric case, where completely different techniques are used, and the results are stronger.

*Tid och plats:* Onsdagen den 10 november kl. 13.15 i rum 306, hus 6, Matematiska institutionen, SU, Kräftriket.

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## HÖGRE SEMINARIUM I SPRÅKFILOSOFI OCH LOGIK

**Dag Westerståhl:**
**On the logicality and constancy of logical constants**

*Abstract:* A model-theoretic approach is particularly suited for an account of quantification in natural languages. Distinguish (generalized) quantifier expressions from predicate expressions (denoting relations between individuals). Are quantifier expressions logical constants whereas predicate expressions are not? While there may be no adequate definition of this notion, I will look at two necessary conditions, applicable to expressions of any type. The first — topic-neutrality — is a familiar model-theoretic requirement (Isomorphism Closure), with precise consequences that will be briefly discussed, as well as a stronger proposal by Feferman with different and more drastic consequences. But I will focus on the second — constancy — which is less precise but no less significant. The idea is to use basic intuitions about form and entailment as data, concluding that (most) quantifier expressions are constants whereas (most) predicate expressions are not. More precisely, given a Bolzano style notion of appropriate replacement, look at preservation of entailment under such replacements (Bolzano, and later Tarski, rather considered preservation of truth). These facts about constancy are somewhat trivial (perhaps too trivial to be noticed), but allow the conclusion that quantifier expressions such as most or few should not be interpreted in models, contrary to proposals by e.g. Barwise & Cooper (1981). Thus, they justify first-order models (not first-order logic!) for the semantics of quantification.

The talk is based on chapter 9 in a forthcoming book with Stanley Peters.

*Tid och plats:* Fredagen den 29 oktober kl. 10.00 – 12.00 i rum D700, Filosofiska institutionen, SU.

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## SEMINAR IN STATISTICAL GENETICS AND BIOINFORMATICS

**Arne Elofsson:**
**Protein structure and function prediction by automated distant homology detection**

*Abstract:* CASP provides a unique opportunity to compare the performance of automatic fold recognition methods with the performance of manual experts, that might utilize these methods. We have recently shown that a novel automatic fold recognition server, Pmodeller, is getting close to the performance of manual experts. While a small group of experts still perform better, most of the experts participating in CASP5 actually performed worse, although they had full access to all automatic predictions. Pmodeller is based on Pcons (Lundström, 2001), the first "consensus" predictor that utilizes predictions from many other servers. Therefore, the success of Pmodeller and other consensus servers should be seen as a tribute to the collective of all developers of fold recognition servers. Further, we show that the inclusion of another novel method, ProQ (Wallner, 2003), to evaluate the quality of the protein models improves the predictions.

*Tid och plats:* Tisdagen den 9 november kl. 14.00 – 16.00 i rum 306 (Cramérrummet), hus 6, Matematiska institutionen, SU, Kräftriket.

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## ALGEBRASEMINARIUM

### Erik Backelin: Quantum flag variety, quantum $D$-modules and localization of quantum groups

*Abstract:* We define the quantum flag variety of a quantum group $U_q$ (or more precisely, its category of sheaves) using the language of equivariant sheaves. We give a new interpretation of quantum Kempf-vanishing and use this to prove that our category is a Proj-category in the sense of Artin. Then we define quantum $D$-modules and prove the following versions of Beilinson-Bernsteins localization theorem:

1) $q$ generic. The global section functor gives an equivalence between category of $D$-modules and representations of $U_q$ with fixed central character.
2) $q$ root of unity. The global section functor induces an equivalence of derived categories.

In the root of unity case there is an interesting underlying geometry. The sheaf $D$ of quantum differential operators is an Azumaya algebra over its centre $Z$ and, moreover, $Z$ can be interpreted as the sheaf of functions on (certain twists of) the classical cotangent bundle $T * X$ of the flag variety $X$. This way we end up with a derived equivalence between category of representations of $U_q$ and certain categories of sheaves on $T * X$. Similar results for modular representations have been established by Bezrukavnikov et al. Combining their results with ours, we see that modular representations and representations of the quantum group are linked on the derived level as sheaves on $T * X$ in char 0 are related to ditto in char $p$. There is good hope that this will be enough to deduce G. Lusztig's famous conjecture on character formulas in modular representation theory.

This is a joint work with K. Kremnitzer, Tel Aviv.

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

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## SEMINAR IN THEORETICAL AND APPLIED MECHANICS

### Karl-Erik Thylwe: Ermakov-Lewis invariants — tools in the Regge-pole analysis of scattering

*Abstract:* An amplitude-phase formula for the $S$-matrix due to a central potential is derived. The derivation makes use of invariants of the Ermakov-Lewis type. The formulas allow calculation of Regge-pole positions and residues to be made on the real radial $r$-axis, with an additional flexibility to optimize its numerical aspects.

Important equations of the amplitude-phase method can be interpreted as a so-called Ermakov system. Ermakov systems of various complexity have been studied because of their invariants. In the amplitude-phase analysis such invariants are expressed in terms of two functions that are solutions to either the Schrödinger equation or the nonlinear Milne equation.

*Tid och plats:* Tisdagen den 9 november kl. 13.15 i seminarierummet, Institutionen för mekanik, KTH, Teknikringen 8.

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## POPULÄRVETENSKAPLIG FÖRELÄSNING I FYSIK

**Håkan Snellman:**
**Det svänger om neutrinerna:**
**Om universums svårfångade partiklar**

*Sammanfattning:* Neutrinerna är en klass av elementarpartiklar som växelverkar mycket svagt med annan materia. Sedan 1998 har nya, delvis oväntade egenskaper hos neutrinerna påvisats, bl.a. att de har massa. Det betyder att svävningar uppstår mellan neutriner på ett intressant sätt, något som kallas neutrinooscillationer. Genom att studera dessa svävningar har man fått en ny bild av neutrinerna som antyder att ny fysik borde finnas.

*Tid och plats:* Måndagen den 8 november kl. 18.30 i Oskar Kleins auditorium, Roslagstullsbacken 21, AlbaNova universitetscentrum.

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## SEMINARIUM I MATEMATISK STATISTIK

**Aihua Xia:**
**Stein's method: from Poisson approximation**
**to a discrete central limit theorem**

*Abstract:* We want to approximate $\mathbb{P}(W \in A)$ for $A \subset \{\ldots, -2, -1, 0, 1, 2, \ldots\}$ and $W$ a sum of independent (or weakly dependent) integer-valued random variables $\xi_1, \xi_2, \ldots, \xi_n$ with finite second moments. There are two cases to consider.

Case 1: Majority of $\mathbb{P}(\xi_i \neq 0)$, $i = 1, \ldots, n$, are small, for example, $W$ counts the number of occurrences of certain rare events.

Case 2: Majority of $\mathbb{P}(\xi_i \neq 0)$, $i = 1, \ldots, n$, are relatively large, then the distribution of $W$ should behave like a "discrete normal".

The first case is well approximated by a Poisson or a modified Poisson such as compound Poisson, Poisson signed measures with errors of approximation estimated by Stein-Chen method. Barbour's probabilistic interpretation of Stein-Chen method for estimating the error of Poisson approximation not only paved a way for investigating Poisson process approximation, but also provided an opportunity for studying other approximations. Xia (1999) gave a purely probabilistic proof of Stein bound for Poisson approximation, and the case of approximations by general distributions on the non-negative integers was studied by Brown and Xia (2001). The methods in Brown and Xia (2001) apply to a very large class of approximating distributions on the non-negative integers, including Poisson, binomial, negative binomial, as well as a natural class for higher-order approximations by probability distributions rather than signed measures. This offers a comprehensive solution to case 1.

In terms of case 2, Goldstein and Xia found a family of discrete distributions which behave in the same way as normal does in the central limit theorem.

This talk will cover the following topics:

1. The principle of Stein's method for discrete distribution approximations.
2. Why do we need to have Markov birth-death processes in this exercise?
3. Around Poisson approximation.
4. Polynomial birth-death (PBD) approximation.
5. Zero biasing and a discrete central limit theorem.

*Tid och plats:* Måndagen den 15 november kl. 15.15 – 17.00 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

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