



# BRÅKET



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

NR 12

FREDAGEN DEN 1 APRIL 2005

### BRÅKET

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

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Institutionen för matematik  
KTH  
100 44 Stockholm

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Sista manustid för nästa nummer:  
Torsdagen den 7 april kl. 13.00.

### Disputation i matematik

Tommy Ekola disputerar vid KTH  
på avhandlingen *A Numerical  
Study of the Lorenz and Lorenz-  
Stenflo Systems* fredagen den 22  
april kl. 10.00. Se sidan 5.

### SEMINARIER

Fr 04–01 kl. 11.00–12.00. Optimization and Systems  
Theory Seminar. Professor Clyde F. Martin,  
Department of Mathematics, Texas Tech Uni-  
versity, USA: *Numerical solution of ODE's and  
robust control*. Seminarierum 3721, Institutionen  
för matematik, KTH, Lindstedtsvägen 25, plan 7.  
Se sidan 3.

Må 04–04 kl. 10.30–11.30. Seminar in Random and  
Deterministic Spectra. Eric Nordenstam:  
*The Selberg integral*. Seminarierum 3721, Institu-  
tionen för matematik, KTH, Lindstedtsvägen 25,  
plan 7.

Må 04–04 kl. 15.15. Seminarium i matematisk statistik.  
Erik Brodin, Matematisk statistik, Chalmers  
tekniska högskola och Göteborgs universitet: *On  
quantile estimation*. Seminarierum 3733, Institu-  
tionen för matematik, KTH, Lindstedtsvägen 25,  
plan 7. Se Bråket nr 11 sidan 3.

Må 04–04 kl. 18.30. Populärvetenskaplig föreläsning i  
fysik. Docent Mark Pearce, Fysik, KTH:  
*Kosmiska fyrverkerier och det subatomära regnet:  
Om de mest energetiska partiklarna i universum  
och hur man kan observera dem*. Oskar Kleins  
auditorium, Roslagstullsbacken 21, AlbaNova  
universitetscentrum. Se Bråket nr 11 sidan 5.

Ti 04–05 kl. 10.15. Plurikomplexa seminariet. Lev  
Aizenberg, Tel-Aviv: *Classical results of Bohr  
and Rogosinski on power series and their multi-  
variate analogues*. Rum 306, hus 6, Matematiska  
institutionen, SU, Kräftriket. Se sidan 3.

Ti 04–05 kl. 13.15. Plurikomplexa seminariet. Mats  
Andersson, Göteborg: *The membership problem  
for polynomial ideals in terms of residue currents*.  
Rum 306, hus 6, Matematiska institutionen, SU,  
Kräftriket. Se sidan 4.

Fortsättning på nästa sida.

### Seminarier (fortsättning)

- Ti 04–05 kl. 14.00–15.00. Mittag-Leffler Seminar. Eran Nevo**, Hebrew University of Jerusalem: *The lower bound theorem for doubly Cohen-Macaulay complexes*. Institut Mittag-Leffler, Auravägen 17, Djursholm.
- Ti 04–05 kl. 15.30–16.30. Mittag-Leffler Seminar. Guoce Xin**, Brandeis University: *A short proof of the Zeilberger-Bressou  $q$ -Dyson theorem*. Institut Mittag-Leffler, Auravägen 17, Djursholm.
- On 04–06 kl. 10.00–11.00. Presentation av examensarbete i matematik. Åsa Wall Månsson**: *Matematiska bevis. Beskrivning av olika bevismetoder och hur de används*. Handledare: **Christian Gottlieb**. Sal 37, hus 5, Matematiska institutionen, SU, Kräftriket. Se sidan 4.
- On 04–06 kl. 13.15–14.15. Seminarium i analys och dynamiska system. Anders Szepessy**, KTH: *Stochastic hydrodynamic limits of Stochastic Ising models*. Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 5.
- On 04–06 kl. 13.15. Algebra and Geometry Seminar. Ralf Fröberg**: *When is the tangent cone of a curve Cohen-Macaulay?* Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 6.
- On 04–06 kl. 15.15. Seminarium i matematisk statistik. Thomas Kaijser**, Linköpings universitet: *On hidden Markov processes and stochastic iterations*. Rum 306 (Cramértrummet), hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 4.
- On 04–06 kl. 16.00–17.00. KTH/SU Mathematics Colloquium. Per Martin-Löf**, SU: *Zermelo's axiom of choice: What was the problem with it?* Sal 14, hus 5, Matematiska institutionen, SU, Kräftriket. Se Bråket nr 11 sidan 3.
- To 04–07 kl. 14.00–15.00. Mittag-Leffler Seminar. Jan Snellman**, SU: *Noncommutative term orders and a poset of compositions*. Institut Mittag-Leffler, Auravägen 17, Djursholm.
- To 04–07 kl. 15.30–16.30. Mittag-Leffler Seminar. Helge Tverberg**, University of Bergen: *On Radon's theorem and its generalizations in geometry, topology and combinatorics*. Institut Mittag-Leffler, Auravägen 17, Djursholm.
- Fr 04–08 kl. 10.15. Mathematical Physics Seminar. (Observera lokalen!) Professor Alexei Smirnov**, ICTP Trieste och Technische Universität München: *Solar neutrinos: Large mixing angle solution and beyond*. Seminarierum FA32, Roslagstullsbacken 21, AlbaNova universitetscentrum.
- Må 04–11 kl. 15.15–17.00. Seminarium i matematisk statistik. Lars Holst**: *Om rekord (fortsättning från seminarierna den 7 och den 21 mars)*. Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 6.
- Ti 04–12 kl. 14.00–15.00. Mittag-Leffler Seminar. Francesco Brenti**, Università di Roma "Tor Vergata": *Kazhdan-Lusztig and  $R$ -polynomials for Hermitian symmetric pairs*. Institut Mittag-Leffler, Auravägen 17, Djursholm.
- Ti 04–12 kl. 15.30–16.30. Mittag-Leffler Seminar. Herbert Wilf**, University of Pennsylvania: *Patterns in permutations of integer compositions and multisets*. Institut Mittag-Leffler, Auravägen 17, Djursholm.

**Fortsättning på nästa sida.**

### Seminarier (fortsättning)

**On 04–13 kl. 10.15. Mathematical Physics Seminar.** Dr Walter Winter, IAS Princeton: *Physics applications of very long neutrino factory baselines*. Seminarierummet i hus 11 (rum 112:028), Roslagstullsbacken 11, AlbaNova universitetscentrum.

**On 04–13 kl. 16.00–17.00. KTH/SU Mathematics Colloquium.** Zeev Rudnick, Tel-Aviv University: *Eigenvalue statistics and lattice points*. 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 sidan 6.

**To 04–14 kl. 14.00–15.00. Mittag-Leffler Seminar.** Torsten Ekedahl, SU: *p-Schubert calculus*. Institut Mittag-Leffler, Auravägen 17, Djursholm.

**To 04–14 kl. 15.30–16.30. Mittag-Leffler Seminar.** Francois Bergeron, University of Quebec, Montreal: *Diagonal coinvariants, what's up?* Institut Mittag-Leffler, Auravägen 17, Djursholm.

## OPTIMIZATION AND SYSTEMS THEORY SEMINAR

**Clyde F. Martin:**

### Numerical solution of ODE's and robust control

*Abstract:* In this talk some preliminary ideas about the relationship between robust control and the solution of ordinary differential equations will be presented. Three problems will be discussed. The first is just a toy example of solving  $\dot{x} = \lambda x$ ,  $x(0) = 1$ , the second is a more important example of solving an equation whose solution should remain on the unit sphere, and the third is an example based on using control theoretic smoothing splines as a corrector in a predictor corrector algorithm.

*Tid och plats:* Fredagen den 1 april kl. 11.00–12.00 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

## PLURIKOMPLEXA SEMINARIET

**Lev Aizenberg:**

### Classical results of Bohr and Rogosinski on power series and their multivariate analogues

*Abstract:* A classical theorem of Harald Bohr (1914) asserts that if the sum of a power series in the unit disk is less than 1 in modulus, then the sum of the absolute values of the terms of this series is less than 1 in the disk of radius  $1/3$ , and this constant  $1/3$  is sharp. A new very simple proof of this theorem will be given in the lecture.

Rogosinski's theorem (1923) asserts that in the same situation each partial sum of the series is less than 1 in modulus in the disk of radius  $1/2$ , and here just  $1/2$  is sharp. This first part of the lecture will be accessible even to students. In the second part multivariate analogues of these results will be discussed.

*Tid och plats:* Tisdagen den 5 april kl. 10.15 i rum 306, hus 6, Matematiska institutionen, SU, Kräftriket.

## PLURIKOMPLEXA SEMINARIET

**Mats Andersson:**

### The membership problem for polynomial ideals in terms of residue currents

*Abstract:* Let  $F_1, \dots, F_n$  be polynomials in  $\mathbb{C}^n$  such that their common zero set is discrete and contained in  $\mathbb{C}^n$ . Suppose that, for some given polynomial  $\Phi$ , there are  $Q_j$  such that  $\Phi = F_1 Q_1 + \dots + F_n Q_n$ . A classical theorem due to Max Nöther then states that one can choose  $Q_j$  such that  $\deg F_j Q_j \leq \deg \Phi$ . We will discuss a relation between the vanishing of a globally defined residue current on  $\mathbb{P}^n$  and solution to polynomial ideal problems with control of the degrees. Some classical results, such as Nöther's theorem, appear as simple consequences, and we also get generalizations where the common zero set meets the hyperplane at infinity.

*Tid och plats:* Tisdagen den 5 april kl. 13.15 i rum 306, hus 6, Matematiska institutionen, SU, Kräftriket.

## PRESENTATION AV EXAMENSARBETE I MATEMATIK

**Åsa Wall Månsson: Matematiska bevis.**

### Beskrivning av olika bevismetoder och hur de används

*Handledare:* **Christian Gottlieb.**

*Sammanfattning:* Examensarbetet vänder sig i första hand till dem som studerar matematik och behöver lära sig att bevisa olika matematiska satser. I examensarbetet beskrivs olika typer av bevis samt hur och när de skall användas. De bevistyper som behandlas är: direkt bevis, indirekt bevis (motsägelsebevis och bevis med kontrapositiv) samt induktionsbevis. Dessutom behandlas bevis av existens, entydighet och universalitet. Examensarbetet innehåller en mängd exempel och avslutas med ett avsnitt med kommenterade bevis av några kända satser.

*Tid och plats:* Onsdagen den 6 april kl. 10.00–11.00 i sal 37, hus 5, Matematiska institutionen, SU, Kräftriket.

## SEMINARIUM I MATEMATISK STATISTIK

**Thomas Kaijser:**

### On hidden Markov processes and stochastic iterations

*Abstract:* Let  $X_0, X_1, \dots, X_n, \dots$  denote a Markov chain and let  $Y_1, Y_2, \dots, Y_n, \dots$  be observations of  $X_1, X_2, \dots, X_n, \dots$  respectively. Let  $Z_n$  denote the conditional distribution of the state of the Markov chain at time  $n$  given all observations up to time  $n$ . Since we can consider the observations as random quantities,  $Z_n$  can also be considered as a random quantity. In fact, the  $Z_n$ -process can be obtained as the state sequence of an iterated function system.

In this talk I will discuss the limit behaviour of  $Z_n$  and particularly its distribution under various assumptions.

*Tid och plats:* Onsdagen den 6 april kl. 15.15 i rum 306 (Cramérrummet), hus 6, Matematiska institutionen, SU, Kräftriket.

## SEMINARIUM I ANALYS OCH DYNAMISKA SYSTEM

Anders Szepessy:

### Stochastic hydrodynamic limits of Stochastic Ising models

*Abstract:* Even small noise can have substantial influence on the dynamics of differential equations, e.g. for nucleation and coarsening in phase transformations. The aim of this talk is to present an accurate model for the noise in macroscopic differential equations, related to phase transformations/reactions, derived from more fundamental microscopic Master equations.

I will show that localized spatial averages, with width  $\epsilon$ , of solutions to stochastic Ising models with long range interaction, of width  $\mathcal{O}(1)$ , are approximated with error  $\mathcal{O}(\epsilon^2 + (\gamma/\epsilon)^{2d})$  in distribution by a solution of an Ito stochastic differential equation, with drift as in the mean field model and a small diffusion coefficient of order  $(\gamma/\epsilon)^{d/2}$ , generating noise with spatial correlation length  $\epsilon$ , where  $\gamma$  is the distance between neighbouring spin sites on a uniform periodic lattice in  $\mathbb{R}^d$ .

The proof is simple and based on two ideas: no law of large numbers is applied, instead the proof uses  $\mathcal{O}((\gamma/\epsilon)^{2d})$  consistency with the Kolmogorov-backward equation from a Chapman-Enskog expansion; and the long range interaction yields smoothing and contributes with the  $\mathcal{O}(\epsilon^2)$  error.

*Tid och plats:* Onsdagen den 6 april kl. 13.15–14.15 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

## DISPUTATION I MATEMATIK

Tommy Ekola

disputerar på avhandlingen

### A Numerical Study of the Lorenz and Lorenz-Stenflo Systems

fredagen den 22 april kl. 10.00 i sal M3, KTH, Brinellvägen 64. Till fakultetsopponent har utsetts *professor Robert MacKay*, University of Warwick, Coventry, Storbritannien.

#### *Abstract of the thesis*

In 1998 the Swedish mathematician Warwick Tucker used rigorous interval arithmetic and normal form theory to prove the existence of a strange attractor in the Lorenz system. In large parts, that proof consists of computations implemented and performed on a computer. This thesis is an independent numerical verification of the result obtained by Warwick Tucker, as well as a study of a higher-dimensional system of ordinary differential equations introduced by the Swedish physicist Lennart Stenflo.

The same type of mapping data as Warwick Tucker obtained is calculated here via a combination of numerical integration, solving optimization problems, and a coordinate change that brings the system to a normal form around the stationary point in the origin. These data are collected in a graph and the problem of determining the existence of a strange attractor is translated to a few graph-theoretical problems. The end result, after the numerical study, is a support for the conclusion that the attractor set of the Lorenz system is a strange attractor and also for the conclusion that the Lorenz-Stenflo system possesses a strange attractor.

## ALGEBRA AND GEOMETRY SEMINAR

**Ralf Fröberg:**

**When is the tangent cone of a curve Cohen-Macaulay?**

*Abstract:* If  $C$  is an analytically irreducible curve, we can give a criterion for the CM-ness of the tangent cone. Some known and some new results will follow as applications.

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

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## SEMINARIUM I MATEMATISK STATISTIK

**Lars Holst: Om rekord**

**(fortsättning från seminarierna den 7 och den 21 mars)**

*Sammanfattning:* Asymptotik studeras för cykeltal, rekordantal och rekordtider för en icke-stationär rekordmodell. Därvid kommer bl.a. Eulers och Gauss representationer av gammafunktionen till användning.

*Tid och plats:* Måndagen den 11 april kl. 15.15–17.00 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

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## KTH/SU MATHEMATICS COLLOQUIUM

**Zeev Rudnick:**

**Eigenvalue statistics and lattice points**

*Abstract:* One of the more challenging problems in spectral theory and mathematical physics today is to understand the statistical distribution of eigenvalues of the Laplacian on a compact manifold. Among the most studied quantities is the counting function for eigenvalues in a window  $[E, E + S]$ , with the position  $E$  of the window chosen at random and the window size  $S = S(E)$  depending on its position. I will describe what is known about the statistics of this counting function for the very simple case of the flat torus, where the problem reduces to counting lattice points in annuli.

*Tid och plats:* Onsdagen den 13 april kl. 16.00–17.00 i 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.

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